Mar. 1930

Electrical Manufacturing

Vol. 5 A Gage Publication No. 3

MACHINE SCREWS *and* NUTS

SCREW MACHINE PRODUCTS

Since 1849

OUR business is that of making millions of parts from many metals — by specializing on this work we have learned to do it well.

And, through specializing, we have simplified methods of arriving at the final solution of many problems involving screw machine products and machine screws and nuts.

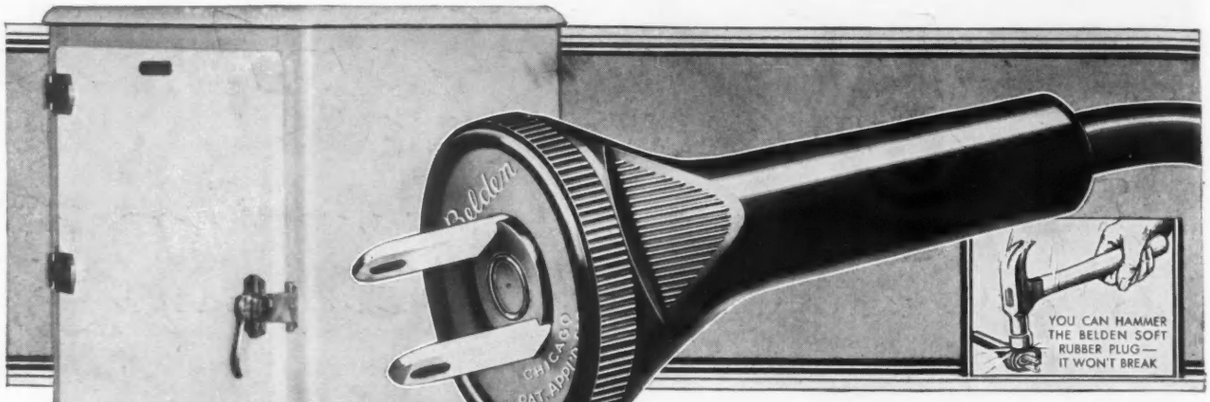
Put Blake and Johnson experience to the test—whether you want one thousand or a million parts.

THE BLAKE & JOHNSON COMPANY

1497 Thomaston Avenue

Waterville, Conn.

Since 1849



Kelvinators are equipped with the Belden Soft Rubber Plug

A consistent advertising program in the Saturday Evening Post is telling millions of readers about the Belden Soft Rubber Plug which is

STANDARD EQUIPMENT on the following:

- 22 Washing Machines
- 21 Radio Units
- 15 Medical Equipments
- 14 Electrical Tools
- 6 Refrigerators
- 3 Paint Sprayers
- 7 Business Machines
- 2 Vacuum Cleaners
- 4 Floor Machines
- 2 Portable Saws
- 2 Grinders
- 27 Miscellaneous Machines

Like 125 other manufacturers of electrical appliances, Kelvinator has adopted the Belden Soft Rubber Plug as a standard feature of Kelvinator Electric Refrigerators.

Manufacturers, dealers, and appliance users all hail the Belden Soft Rubber Plug as the solution for the appliance plug problem. Breakable appliance plugs need no longer be tolerated!

A consistent Belden advertising program in the Saturday Evening Post is carrying the story of this Unbreakable Soft Rubber Plug to millions of appliance users and teaching them to look for the Belden Soft Rubber Plug when they buy.

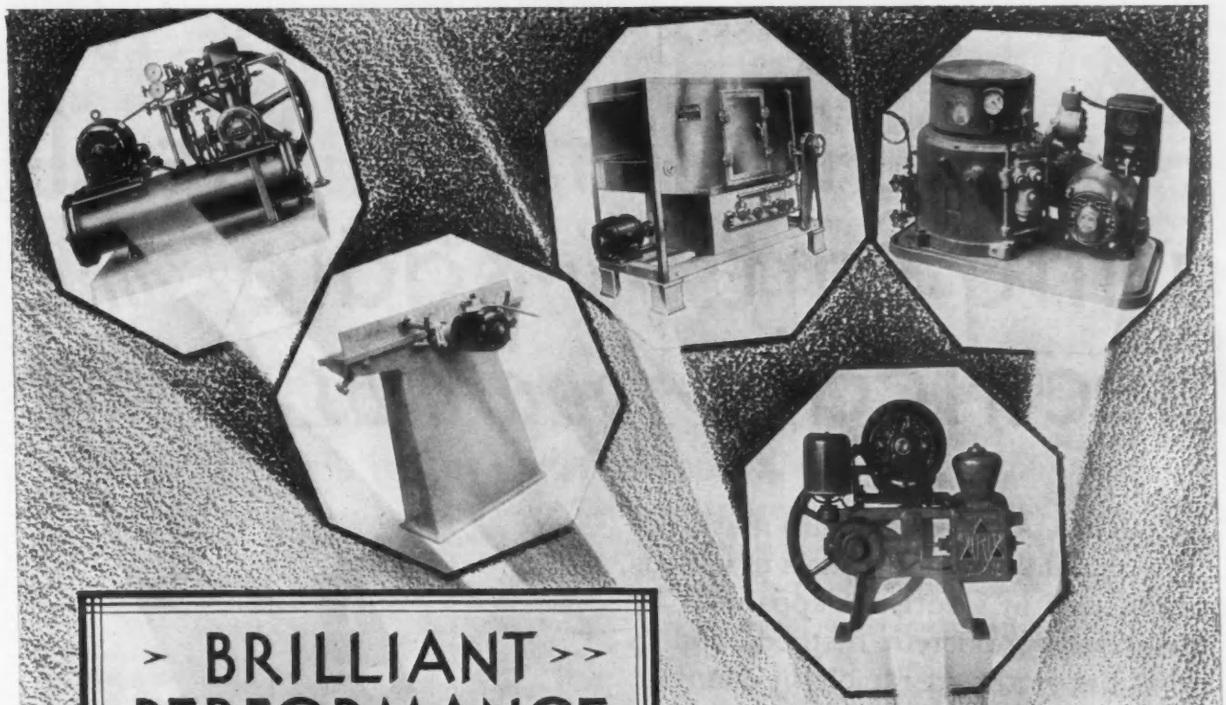
This trouble-proof plug is a sales feature that appliance buyers appreciate and manufacturers of appliances claim that over-all costs are reduced when this trouble-proof plug is used because breakage is eliminated. Write for the complete story.

Belden Manufacturing Co., 4633W. Van Buren St., Chicago, Ill.

Belden

Belden Products

Beldenamel and Textile Magnet Wire • Bakelite Moldings • Coil Windings • Automotive Wires and Cables • Airplane Assemblies • Radio Wires, Cords and Cables • Rubber Covered Wires • Armored Cables • Flexible Armature Wires • Motor Lead Wires • Braided and Stranded Copper Cables • Cotton Sleeving



BRILLIANT PERFORMANCE

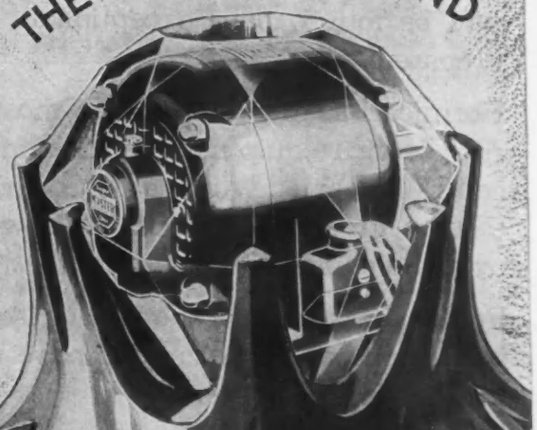
Motors are much alike in appearance—as diamonds look much alike to the casual glance. It takes the searching light of actual use to reveal a motor's value—or its flaws. Records* of long faithful service—records* of perfect functioning under conditions that have amounted, in some cases, to downright abuse—add lustre to the reputation of Master Guaranteed Motors.

They are built with reserve factors of safety to keep them running and protect the reputation of the appliances they drive. They have large starting and overload capacities. They start and operate on voltages well below normal. Due to improved bearing construction and lubrication, they will operate for unusually long periods without attention. We invite you to consult us in regard to your specific requirements.

THE MASTER ELECTRIC COMPANY
DAYTON, OHIO

Not just a phrase—details of some of these unusual performance records will be submitted upon request.

THE POWER DIAMOND



It's a MASTER

STOCKS CARRIED IN PRINCIPAL CITIES

MORE THAN 100 SERVICE STATIONS

MASTER GUARANTEED MOTORS

1/20 TO 10 H.P.

Dayton THE MASTER ELECTRIC CO. Ohio

Not More Than 40°

Marked Insulating Parts for Radio and Electrical Apparatus

FORMICA is equipped to mark terminal strips and panels of various sorts used in electrical apparatus by two or three different methods and to turn the work out rapidly in quantity.

For almost any sort of service required by the electrical industry . . . Formica will be found to be exceptionally well prepared.

Formica has the largest and most varied service equipment in its industry, centrally located where quick deliveries can be given to factories everywhere over the shortest average haul.

For 17 years some of the leading American electrical organizations have used this service ***consistently***.

Send your blue prints for quotations

THE
FORMICA
INSULATION
COMPANY

4626 Spring Grove Ave.
CINCINNATI, OHIO

FORMICA

Electrical Manufacturing

Reg. U. S. Patent Office

Volume 5 | MARCH, 1930 | Number 3

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LLOYD W. DUNN, *Art Editor*

ELECTRIAL MANUFACTURING'S editorial program has the following objectives:

Production

To help all electrical manufacturers, including makers of motor-driven products, increase the product's salability, cut unit production costs, quicken turnover, reduce overhead expenses, establish standard methods of work, and spread a better knowledge of raw materials and parts.

Marketing

To spread a better knowledge of and aid electrical manufacturers in adjusting sales management to the buyers' market, to aid in making advertising more effective, finding the most profitable distribution channels, and promoting cooperative market development.

Administration

To further the working out of sounder management policies and better executive control, coordinating sales and production schedules, promoting research, and developing better industry relations.

Repairing

To help all motor repair shops to build better business by developing a sounder organization, improving management, policies and methods, and developing a keener merchandising point-of-view on the business.

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Chicago Office: 731 Monadnock Block, L. C. Bassett, *Manager* **Cleveland Office:** 501 Caxton Building, Harry Krohn, *Manager*

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They knew what they wanted-

...ir needs, but ... ...ns not understood by them, such as foot-candles, coefficients of utilization, reflection factors and lumens.

"A four per cent return on direct mail advertising is considered very satisfactory. We wrote to 340 architects in San Francisco Bay region, notifying them that we had a set of electrical specifications which would assist them in laying out their work, and offered to send them a copy if they would return a post card which we inclosed. The replies exceeded our fondest expectations—we got 171 requests, or 50 per cent. The consulting engineers of the State are equally in favor of our program."

VICTOR W. HARTLEY
Executive Secretary
California Electrical Bureau
(ELECTRICAL RECORD
Feb., 1930)

HERE is noteworthy evidence of the eager interest shown by architects and electrical engineers in interpreting better and approved wiring practice into their specification writing. These groups, together with builders and electrical inspectors, share a common desire to know more about the proper planning of the electrical system of a building. They are keen executives, and they react instantly to specific, usable and authentic information.

Because they specify, influence and approve the final choice of electrical equipment entering into building projects, they are active factors in the sales plans of manufacturers of such equipment.

The above instance is added proof of what Gage research has already determined. These factors not only realize their need of such service, but they are hungry for it.

Beginning with the first issue of ELECTRICAL SPECIFICATIONS, they will have it. This publication will give them what they have never had—a specifically electrical editorial service of unquestioned authority and utility. The best of modern advice and practice will be available to them in word, illustration and blue print.

Here is a direct-line approach well worth inclusion in the projected advertising of electrical equipment manufacturers. Its effectiveness is at once obvious; it is a specialized publication with a seasoned editorial viewpoint of 38 years' successful service to the electrical industry.

EDITORIAL

Specifications for Complete Installations, with Actual Specifications and Blue Prints

Code Interpretation

Electrical Layouts, Showing Best Methods in Use

How and Why I Specified What I Did, by Leading Architects

Camera Trips and Trends in Electrical Equipment

Ordinance Progress

Inspectors Problems

New Products to Specify

ELECT
SPECIFI

~ and they have it!

ELECTRICAL SPECIFICATIONS

Vol. I No. 1 A Gage Publication April 1930

Included in this issue:

Electrical Elevator Specifications

Electrical Installation for a Small Bank

To Provide the Building Industry with a Better Understanding of Specifications for Electrical Installations

CONTENTS

Model Specifications for Installing Electrical Products

Definitions and Standard Wiring Symbols

Installation Methods

Right and Wrong in Specifying

Readers Round Table

Manufacturers Trade Literature

Classified Index of Electrical Manufacturers whose Products may be specified. Index headings arranged according to the A.I.A. filing classification.

For further information, write to

THE GAGE PUBLISHING CO., INC.

461 Eighth Avenue - - - New York, N. Y.

Publishers to the Electrical Industry Since 1892

ELECTRICAL RECORD

ELECTRICAL MANUFACTURING ELECTRICAL SPECIFICATIONS

METROPOLITAN ELECTRICAL NEWS GAGE LIST OF ELECTRICAL BUYERS

RICAL

CATIONS

Chromium

the *wanted* finish

The modern housewife wants brilliancy in her home equipment—without hard labor! She knows all about CHROMIUM . . . knows how its permanent blue-white brilliance is in keeping with the modernistic trend . . . she knows it needs no polishing. • • • • • • • • •

United Chromium, Inc., renders a licensing service which assures manufacturers of the finest Chromium Plate on a definite production basis. It would be a pleasure to explain details of this service or provide names of our jobbing licensees who would be glad to cooperate in the event your needs do not justify your own plating department.

Executive Office
51 East 42nd St.
New York City

UNITED CHROMIUM

Chicago Cleveland Detroit INCORPORATED *San Francisco Waterbury, Conn.*

DOES YOUR PACKAGING SYSTEM MEET PRESENT DAY NEEDS?

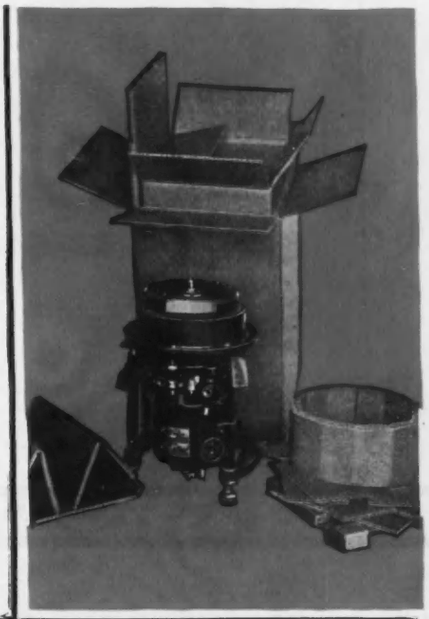
KNOWING HOW is the first requirement in designing a modern packaging system. Maximum economy and efficiency for every conceivable condition of service can be secured only through scientific knowledge—knowledge acquired by training and experience in solving many packaging problems.

The staff of 50 H & D Package Engineers has this training and experience. This fund of accumulated knowledge is at your disposal without charge or obligation.

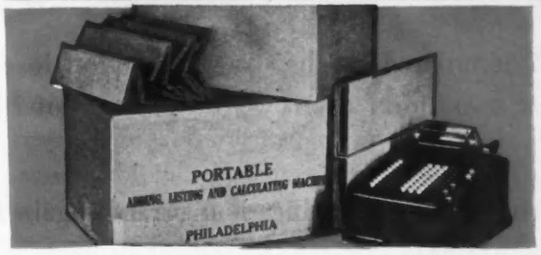
To make sure that your packaging system meets every present day requirement, send for an H & D Package Engineer.

"How to Pack It," an interesting booklet on scientific packaging in your industry will be sent on request. Mail the coupon for a free copy.

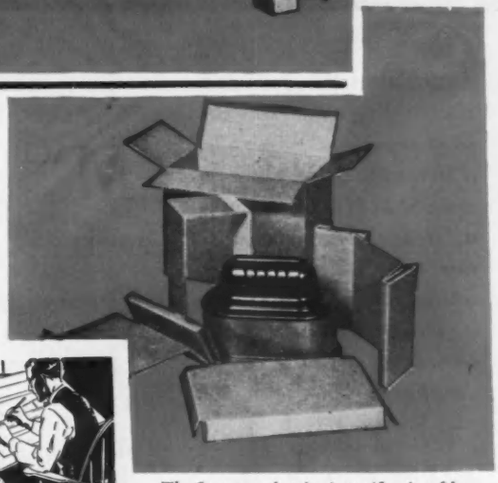
THE HINDE & DAUCH PAPER COMPANY
325 Decatur Street, Sandusky, Ohio
Canadian Address: King's Street Subway and Hanna Ave., Toronto



This specially designed H & D container for an oil burner involved package engineering of a high order.



H & D designed container for safe shipment of electric adding machine.



The Corozone, electric air purifier, is safely shipped in an H & D Engineered Package.

SEND FOR THE PACKAGE ENGINEER

We'll gladly send an H & D Package Engineer without charge or obligation. He may be able to show you how to improve your packing methods and lower your costs.

HINDE & DAUCH *corrugated fibre* SHIPPING BOXES

THE HINDE & DAUCH PAPER COMPANY
325 Decatur Street, Sandusky, Ohio
Please send me a copy of "How to Pack It"

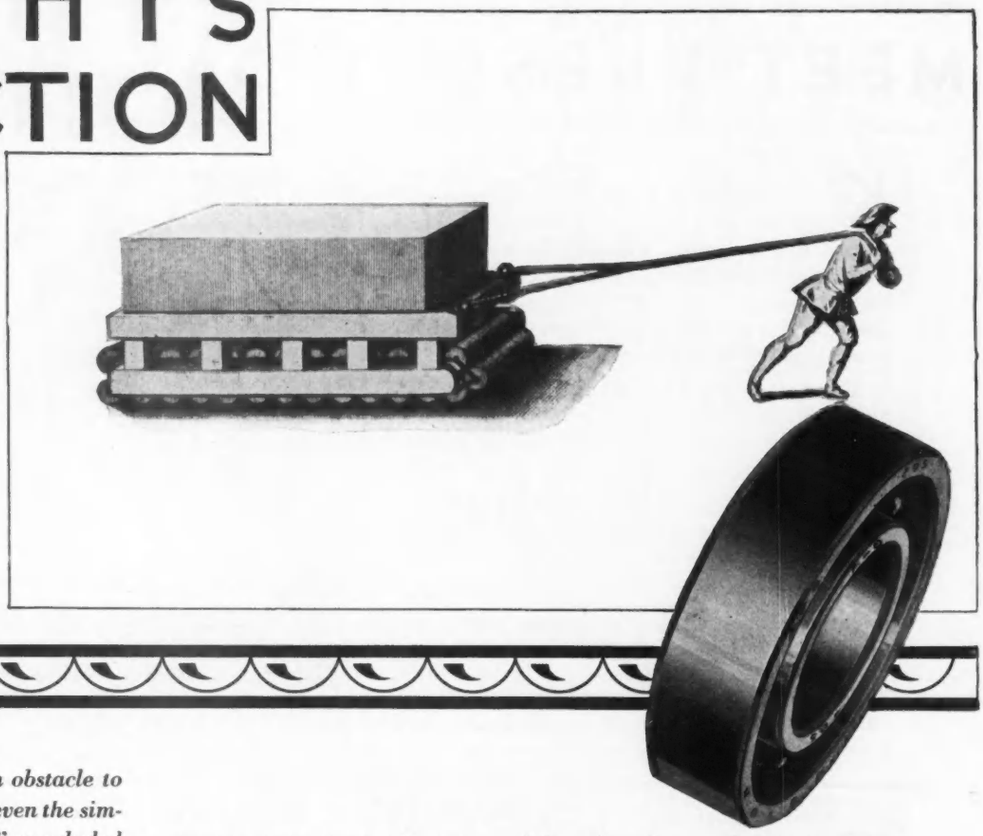
Name .....

Address .....

City ..... State .....

We are interested in packing .....

The WORLD FIGHTS FRICTION



"FRICTION is an obstacle to the building of even the simplest machines" concluded d'Herment, a French engineer. So in 1713 he presented a "sledge of new construction with means of diminishing friction," using rollers or cylinders. This represented an advance toward the elimination of friction.

DISTRICT SALES REPRESENTATIVES

S. W. ANDERSON
565 W. Washington Blvd.
Chicago, Ill.

The
TORRINGTON COMPANY
Curtis Building
2842 W. Grand Boulevard
Detroit, Mich.

MACHINERY hampered by the drag of friction loses money for users, and destroys the prestige of its makers.

The use of Torrington Ball Bearings is insurance against loss and disappointment.

These ball bearings are the scientific product of specialists in precision manufacture. They are made from the finest material, to close tolerances.

Torrington Ball Bearings, by effectively eliminating friction, are builders of business.

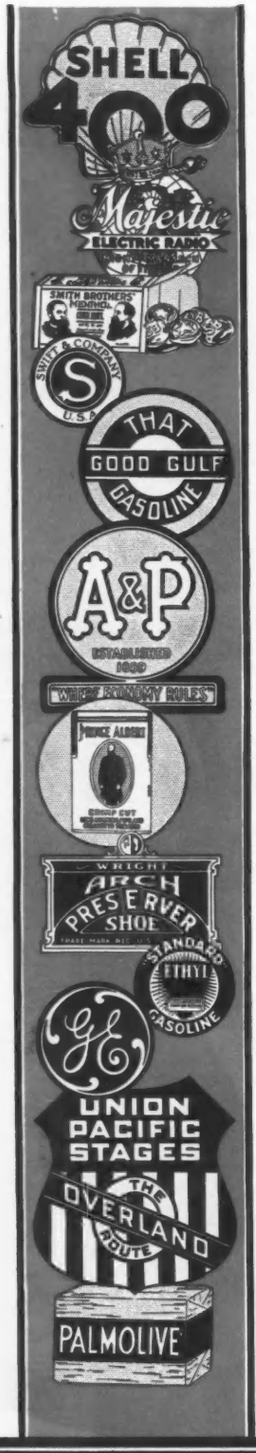
The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

Making Electric Servants Better

IN floor polishers — and in countless other devices which save labor and money or do things quicker and better — Dumore Fractional Horsepower Universal Motors are serving industry in a big way .... Their unusual features of speed, strength, quality of materials and careful precise workmanship embodied in their manufacture, and the economy and long life so evident in their performance, has made Dumore Motors the final choice of many manufacturers of electrically driven devices, over a long period of years .... If you want quality of design, of construction, of performance in the motors you require, or if your problem is an exceptionally difficult one, it will be very advantageous for you to consult with Dumore.

THE DUMORE COMPANY
35 Sixteenth Street Racine, Wisconsin

DUMORE
FRACTIONAL HORSEPOWER
MOTORS



IN 3 MINUTES HE GAVE US A $20,000 IDEA

IN the first minute of his presentation the Meyercord representative showed us $17,000 worth of unused advertising and identification space on our own properties. In another minute he pointed out a waste of $3,000 in our current methods of identification. And, in the third, he demonstrated how we could save that $20,000 and make our program immeasurably more effective by the use of decalcomania transfers.

Now we are realizing the advantages of Meyercord standardization. In the Meyercord Service Department a hundred specialists are engaged in publicizing our name. From the preparation of a new trade-mark to its reproduction in a thousand new places, every phase of our identification is now in expert hands. Never before, with the use of haphazard, expensive media, have we obtained the uniform, colorful, adaptable duplication that decalcomania makes possible.

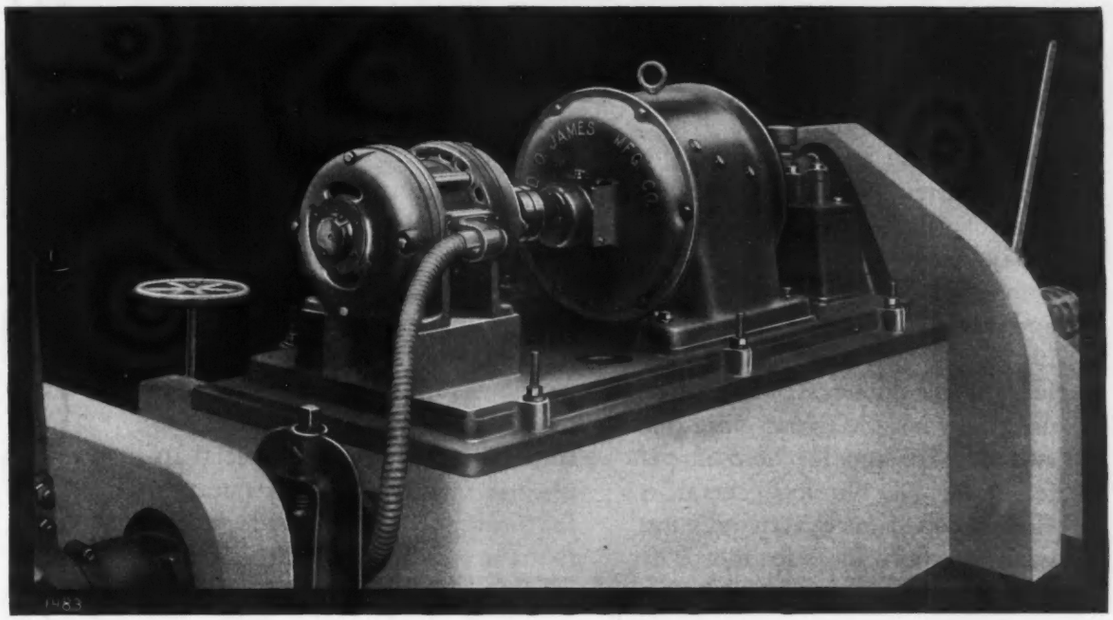
Through the use of this single uniform medium, our trade-mark has gained amazingly in effective identification, and, more important, a sharp increase in sales has indicated an immediate public response.

Every trade-mark on this page is a proof of the practical results achieved by Meyercord Decalcomania Products. Achieve the same profitable distinction for your products. A Meyercord representative will give you a prompt explanation of this thorough identification service.

THE MEYERCORD CO
120 S. La Salle St. Chicago, Ill.

MEYERCORD TRANSFERS

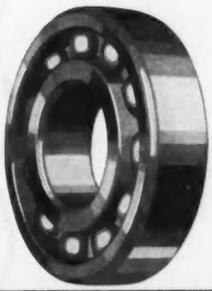
NEW DEPARTURE BALL BEARINGS



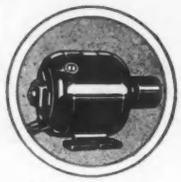
NEW DEPARTURES SUPPORT THE ROTOR OF THIS G. E. MOTOR RIGIDLY, ACCURATELY, ECONOMICALLY

Why motor buyers are saying—— "Equip with New Departures"

EQUIPMENT of electric motors with New Departure Ball Bearings assures lowest possible motor maintenance expense . . . . lubrication is necessary only once a year . . . . bearing wear is negligible . . . . readjustment of bearings is never necessary . . . . bearing rigidity and precision are maintained throughout the long bearing life. Dependable, uninterrupted motor service is assured under shocks and loads incident to all types of drive. The New Departure Mfg. Company, Bristol, Connecticut. Sales and Engineering Offices at Detroit, Chicago, San Francisco, and London, Eng.



NOTHING ROLLS LIKE A BALL



"Wild" ideas are meat and drink to us

EVEN so long ago as the dawn of the twentieth century, when miracles of electricity commonplace today were first being dreamed, Robbins & Myers enjoyed a unique and world-wide reputation for helping young men turn their "wild" ideas into commercial realities. To us came young Marconi more than two decades ago for help in perfecting his *first* wireless generators. Hither, too, came other young men with new-born ideas for motor car starting and ignition, motion picture projectors and kindred visions, now great industries in themselves. Now many builders of electrical apparatus enjoy world fame in their several ways. But the ever greater number of new and wonderful devices being brought to us for practical development indicates that to many men there is still one outstanding manufactory of special application motors with a reputation for turning the shop "upside down" to make profitable actualities out of ideas at which others look askance.

If you have a problem in electrical-motored machinery, come to Robbins & Myers. We offer you the facilities of a completely modern plant, and the experience of 32 years' precision manufacture in designing, building and applying electric motors, generators, fans, and electrical appliances

Partial List of Apparatus to which Robbins & Myers Motors have been successfully applied

Adding Machines
Advertising Displays
Air Compressors
Baker's Machinery
Blowers
Brick Machinery
Car Heaters
Churns
Cloth Cutters
Coffee Mills
Coin Counters
Confectioner's Machinery
Conveyors
Dental Lathes
Dish Washers
Driers
Elevators
Floor Surfacers
Folding Machines
Heaters
Heat Regulators
Hoists
Humidifiers
Ironing Machines
Labeling Machines
Oil Burners
Office Appliances
Organ Blowers
Mailing Machines
Machine Tools
Meat Choppers
Milking Machines
Movie Projectors
Phonographs
Portable Tools
Printing Presses
Pumps
Radio Stations and Receiving Sets
Spray Equipment
Ticket Selling Machines
Vacuum Cleaners
Ventilating Fans
Unit Heaters
Washing Machines
Wrapping Machines

Robbins & Myers, Inc.

Springfield, Ohio **Brantford, Ontario**

1878

1930

MOTORS, FANS, HAND AND ELECTRIC HOISTS AND CRANES

You Need This As Knowledge As Well Bunting Quality

IN its long-continued research and experiment this company has produced a vast fund of proved technical knowledge about the design and composition of the bronze bearing as related to the electrical appliance of which it becomes a part.

This special knowledge unerringly guides the electrical manufacturer in the selection of the correct design, and the proper alloy, both of vital importance in bearing specification. It assures perfect lubrication. It guarantees to the user all of the exclusive economies and advantages of the bronze bearing at its best.

The use of bronze bearings and parts in the widely varied electrical appliance industry often presents confusing factors to the engineer. We offer you the means of determining positively the essential facts in any such situation and also the ready availability of exactly suitable bronze bearings and parts with resulting economy and advantage.

Use Bronze Bearings And Obtain

Maximum bearing life.
Simplified machine design.
Low first cost.
Quietness of operation.
Greater rigidity.
Economy of replacement.

BUNTING

QUALITY

PHOSPHOR BRONZE

BUSHING BEARINGS

PATENTED

THE BUNTING BRASS & BRONZE CO.

TOLEDO, OHIO

BRANCHES AND WAREHOUSES AT

NEW YORK CHICAGO BOSTON

PHILADELPHIA SAN FRANCISCO

EXPORT OFFICE

TOLEDO, OHIO

THE FINEST STEELS OBTAINABLE ARE USED IN FEDERAL BEARINGS.

THAT IS ONE REASON FOR THEIR OUTSTANDING LEADERSHIP.....

FEDERAL Radial Ball Bearings are made of the finest high carbon chrome steels. This is one of the outstanding reasons for "FEDERAL" superiority. The "FEDERAL" reputation for quality means long and economical service under all service conditions.

FEDERAL Radial Ball Bearings are built with the most exacting care. Continual checking of every operation. Each bearing part and every step in processing is individually tested, inspected and calibrated. FEDERALS are as near perfection as human skill can make them.

"FEDERALS" ARE PRECISION BEARINGS OF THE HIGHEST QUALITY

THE FEDERAL BEARINGS CO., INC.
POUGHKEEPSIE
NEW YORK

Detroit Office—917 Book Bldg.

Your **WIRE STOCK**

The Dudlo plant is at your command . . . just as though its giant facilities were part of your own organization. It is your stock room for your magnet wire needs. Here you will find a large variety of sizes and insulations . . . in ample quantities . . . more than any electrical manufacturer could afford to carry at his own plant.

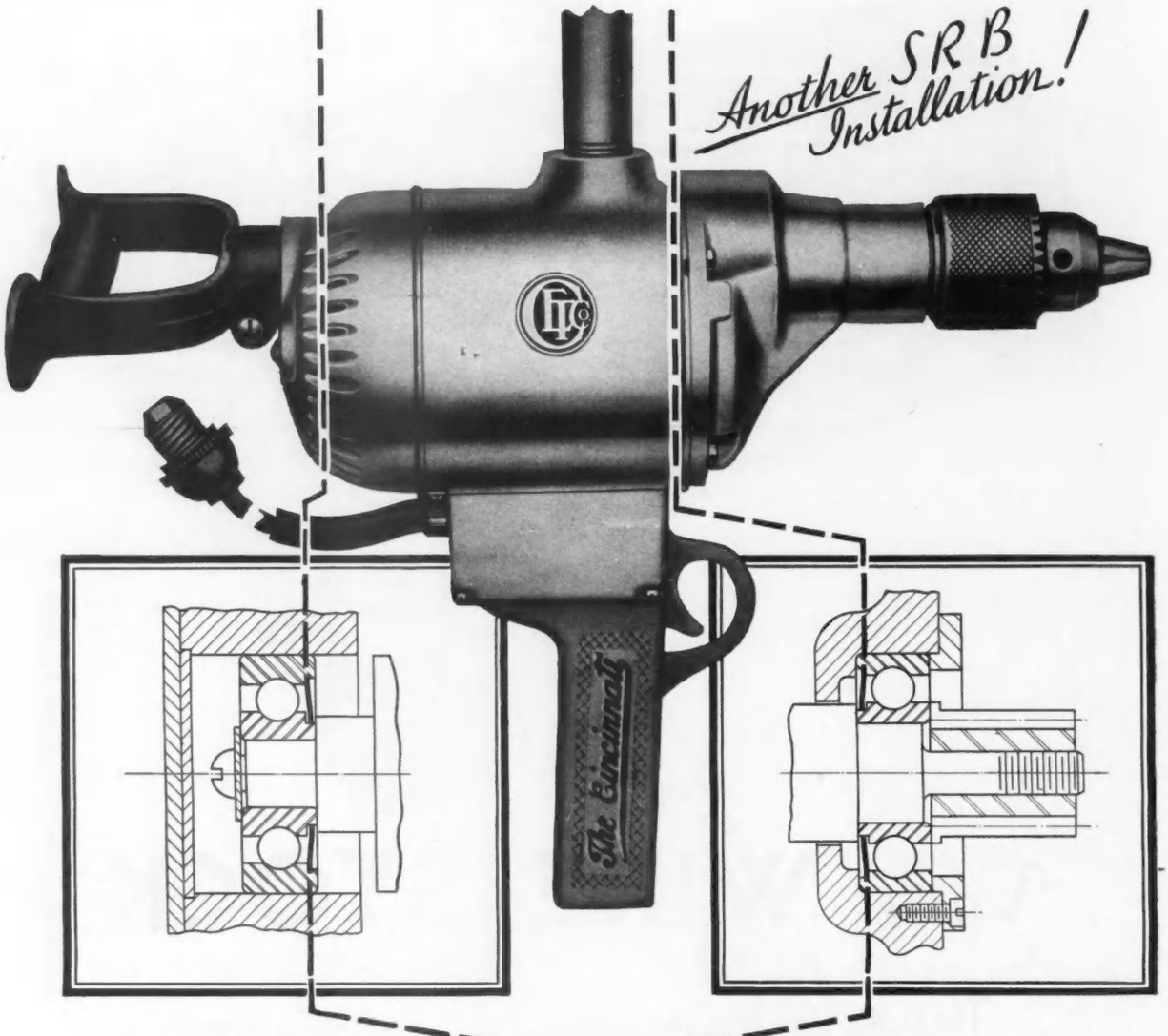
Additional stocks are maintained at strategic points throughout the country for your convenience and emergency demands.

Stocks of standard commercial sizes at principal cities, including Newark, Chicago, St. Louis, San Francisco, and Los Angeles.

DUDLO

DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA

Division of General Cable Corporation



SRB *Lubri-Seal* BALL BEARINGS *in* *The Cincinnati* ELECTRIC DRILLS

ANOTHER manufacturer of Portable Electric Tools who uses SRB *Lubri-Seal* Ball Bearings for increased efficiency and improved performance!

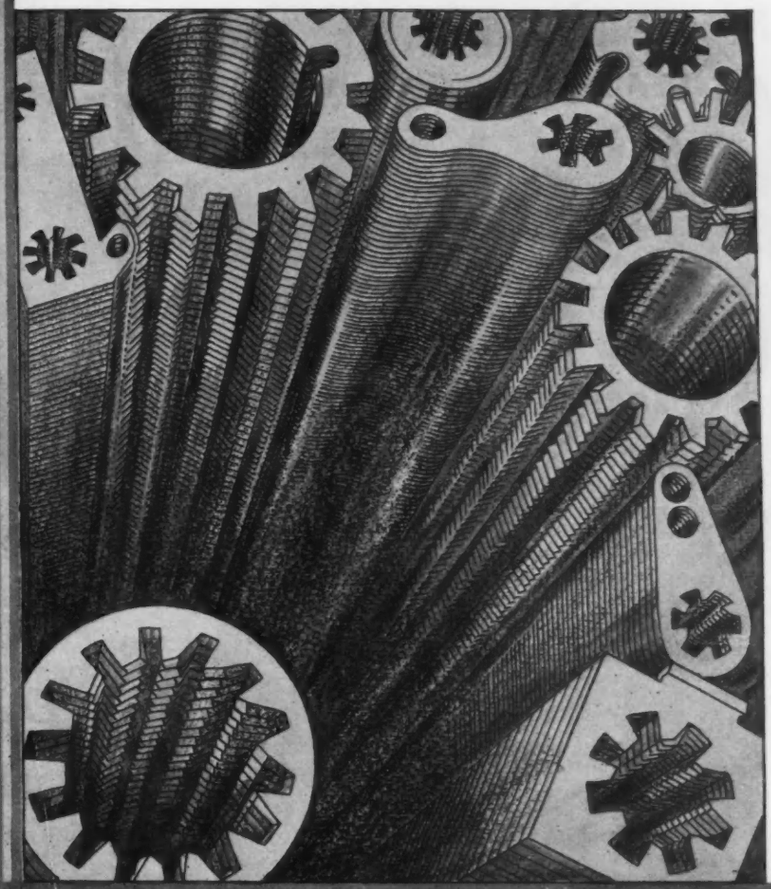
In this application, the *Lubri-Seal* feature guards against leakage of grease to the windings, at the same time excluding dirt and grit from the bearing housing. Lubrication is required only at rare intervals...maintenance is reduced to an absolute minimum.

Let our engineers show you how to *"Lubri-Seal"* your own product for increased efficiency and improved performance.

STANDARD STEEL AND BEARINGS INCORPORATED
Plainville *Connecticut*
DIVISION OF MARLIN-ROCKWELL CORPORATION

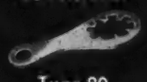
Ball SRB Bearings

millions of lock washers

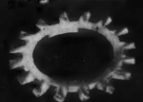


FOR EVERY PURPOSE

Type 15 Countersunk



Type 20 Lug Terminal



Type 11 External Teeth

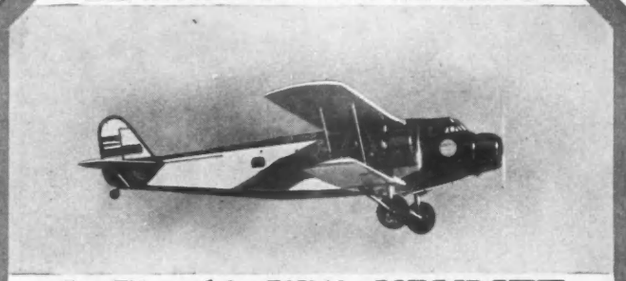
Type 12 Internal Teeth

WRITE FOR SAMPLES

LOOK AT Lock Washers from any standpoint — they must lock nuts and bolts permanently — they must be easily applied — they must not tangle. Only one Lock Washer meets your demands — SHAKEPROOF. Today on practically every type of mechanical device you will find SHAKEPROOF Lock Washers. The SHAKEPROOF principle has been adapted to many special locking problems and is saving manufacturers thousands of dollars on their production. SHAKEPROOF has a place on your product — we will gladly mail you samples of SHAKEPROOF Washers for you to test in your own shop — or our Engineering Department will work with you on adapting SHAKEPROOF for your use. Write for samples today!

SHAKEPROOF
Lock Washer Company
[Division of Illinois Tool Works]
2513 North Keeler Avenue Chicago, Illinois

WHERE UDYLITE
BEAUTIFIES AND PROTECTS



In The Air With UDYLITE

A mighty transport plane wallows through wet clouds; the mail pilot dives below icy sleet; a seaplane sprays salt water—deadly rust lurks in the air. That is why Udylite protection is so popular up there. It is the reason for the Udylite Process guarding one manufacturer's planes which have traveled over eight million miles in the last 28 months.

Precision Products Need this Protection

Whether the product is a swiftly moving plane, a modern automobile, a trim speed boat or precision machinery parts, Udylite is specified as the true protection against rust and corrosion. Submerged in fresh or salt water; subjected to factory steam, cloud moisture or the many other destructive factors, the Udylite Process provides permanent protection, lasting beauty and long, useful life to precision products.

Udylite
RUST PROOFS

THE UDYLITE PROCESS COMPANY
3220 Bellevue Avenue
DETROIT, MICH.

Eastern Office:
30 East 42nd St., New York

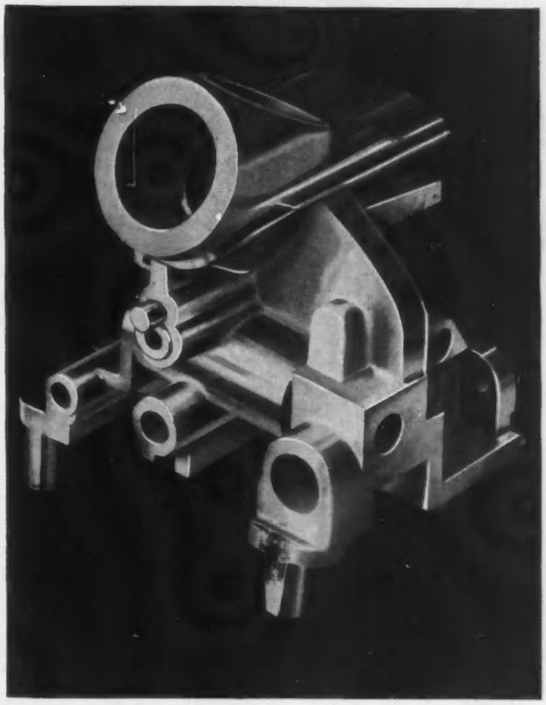
Western Sales Office:
114 Sansome St., San Francisco, Cal.

QUALITY ▾ PRICE DELIVERY ▾ ▾ ▾

Three die casting items for which STEWART has long been favorably known

MEN, Methods, Equipment—three reasons why Stewart is in a position to offer definite advantages in "price and delivery."

Stewart engineers and craftsmen have an unusually complete background of experience. They are specialists in die design and in the adaption of products to production as die-castings. These men work with automatic machinery, principally of Stewart design, in a plant that has always kept in step with the latest die-casting developments.



15,000 *of these frame castings delivered daily to one manufacturer bringing him definite economy*

It is this policy that enables Stewart to offer the utmost in service, quality and price.

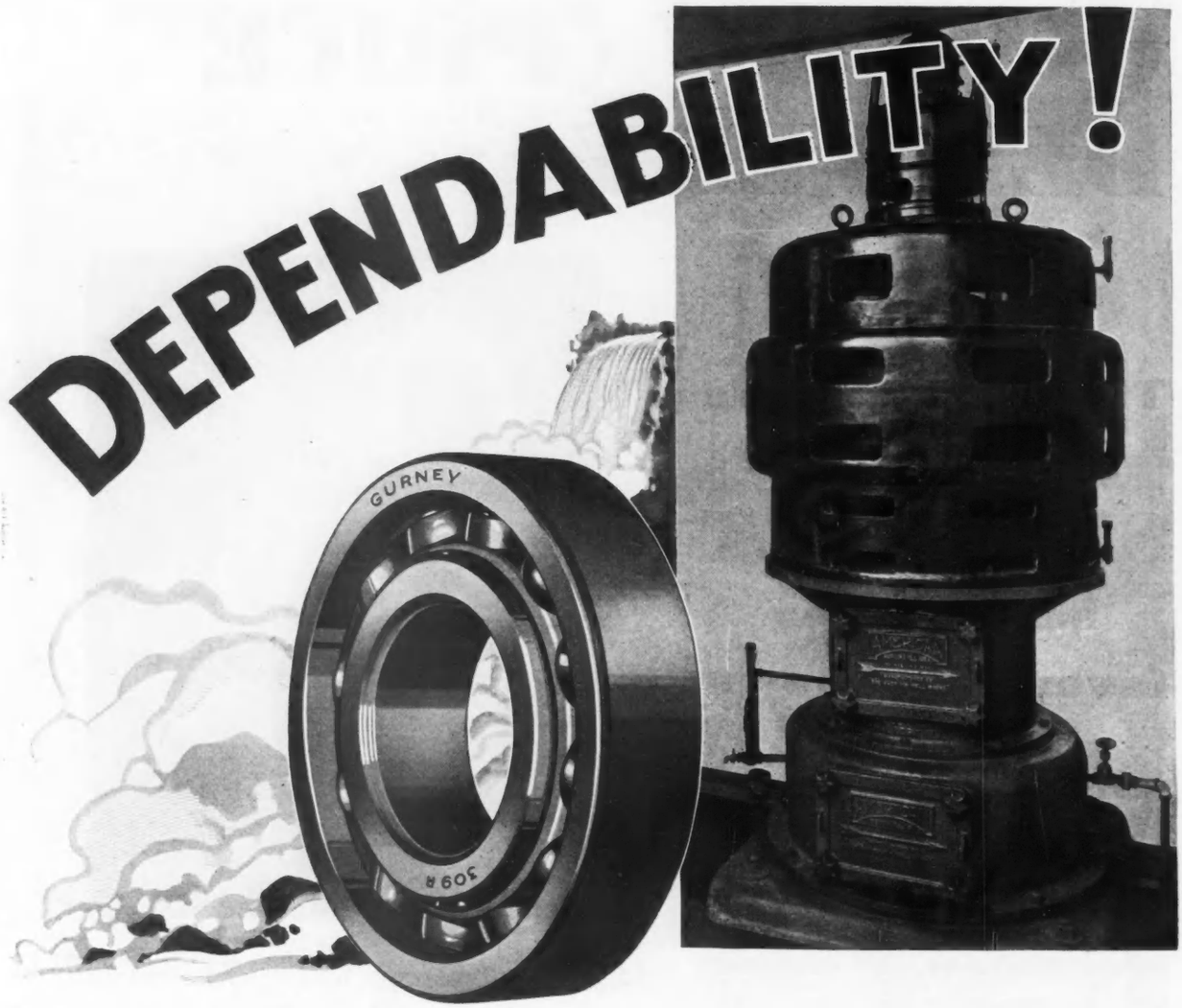
A Stewart engineer will be glad to call and discuss your requirements with you, or we will submit definite information upon receipt of blueprints or samples of your present production.

Stewart

THE STEWART DIE CASTING CORPORATION

4500 Fullerton Parkway, Chicago, Illinois

Detroit • Pittsburg • Dayton • St. Louis
Newark • Cleveland



Gurney Ball Bearings *give day and night endurance to* "IDEAL ELECTRIC" *motors*

Powered with the energy of 187 horses—the Ideal Vertical Electric Motor, shown above, does 24 hour duty in the Pump house of the Municipal water works at Maywood, Illinois. Were it not for ball bearings on the armature shaft such continuous operation would not be possible.

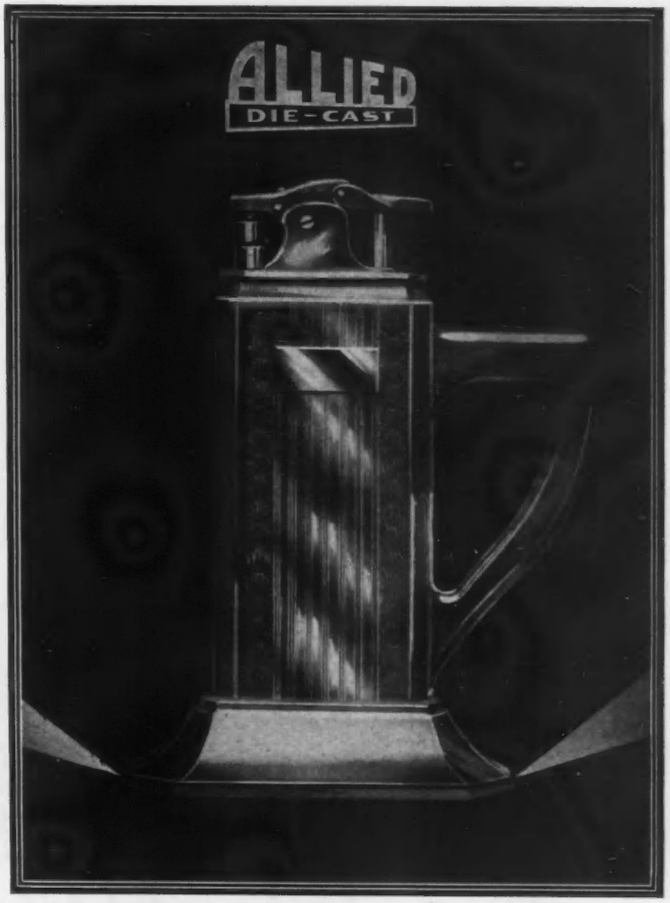
Perfect alignment of armature shaft—accurate maintenance of air gap—long life and freedom from adjustments, are ball bearing features that contribute to the dependability of Ideal Electric Motors.

Gurney Ball Bearing efficiencies are applicable to other products. In fact, where ever a shaft turns, Gurneys can be resultfully applied.

GURNEY BALL BEARING DIVISION
Marlin-Rockwell Corporation
403 Chandler St. JAMESTOWN, N. Y.

GURNEY BALL BEARINGS

This desk lighter is an excellent example of how production economy and real beauty can be combined in a die casting by the Allied Process.



Where Economy Plus Beauty is Important

The manufacturer of the desk lighter illustrated, came to Allied for the reduction of his production costs. At the same time it was necessary to retain all the beauty and strength of the original product.

The Allied staff of engineers successfully redesigned the part and constructed a die from which was produced—the body, the top, wick holder, plunger guide and flint hole, as one complete unit, eliminating considerable assembling and simplifying production so that the desired economies were realized.

Previously, five distinct handlings or assemblings were necessary.

Meanwhile, due to the Allied Process, rigid limits of accuracy were maintained throughout, as well as strength and distinctive beauty of finish.

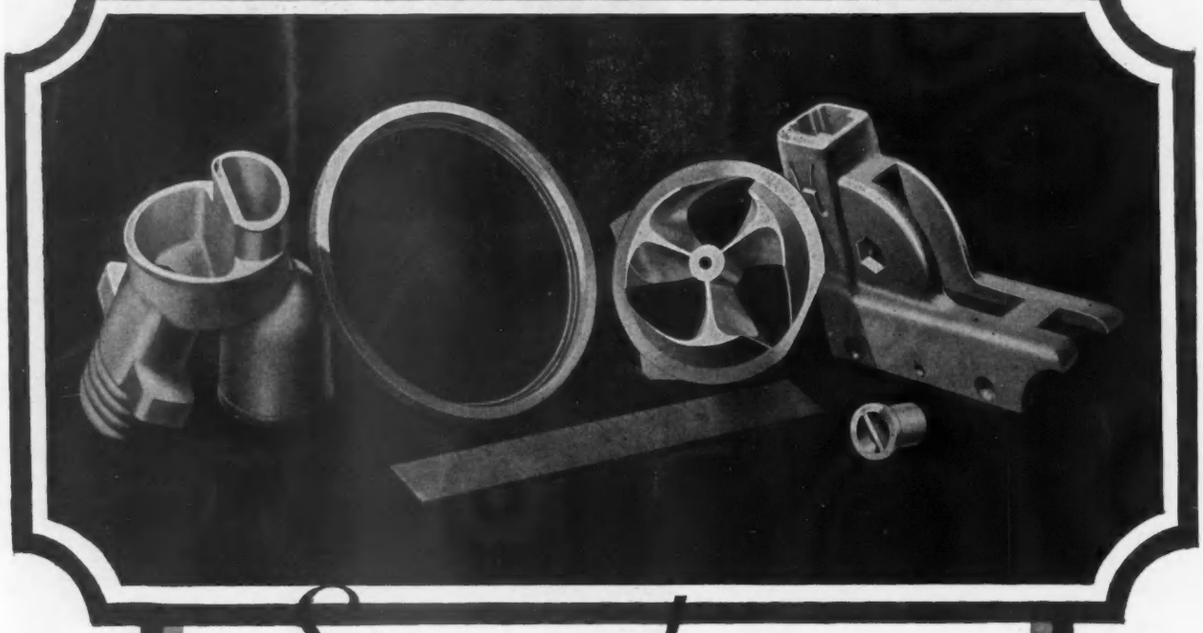
The high speed production of accurate die castings for which the Allied organization is noted, was another factor in making possible the desired savings.

Allied offers you these same advantages in the solution of your production problems.

Our engineers will be glad to consult with you at any time regarding your requirements —or we can quote from samples or blue-prints submitted.

ALLIED DIE CASTING CORP.

Long Island City, N. Y.



Soundness

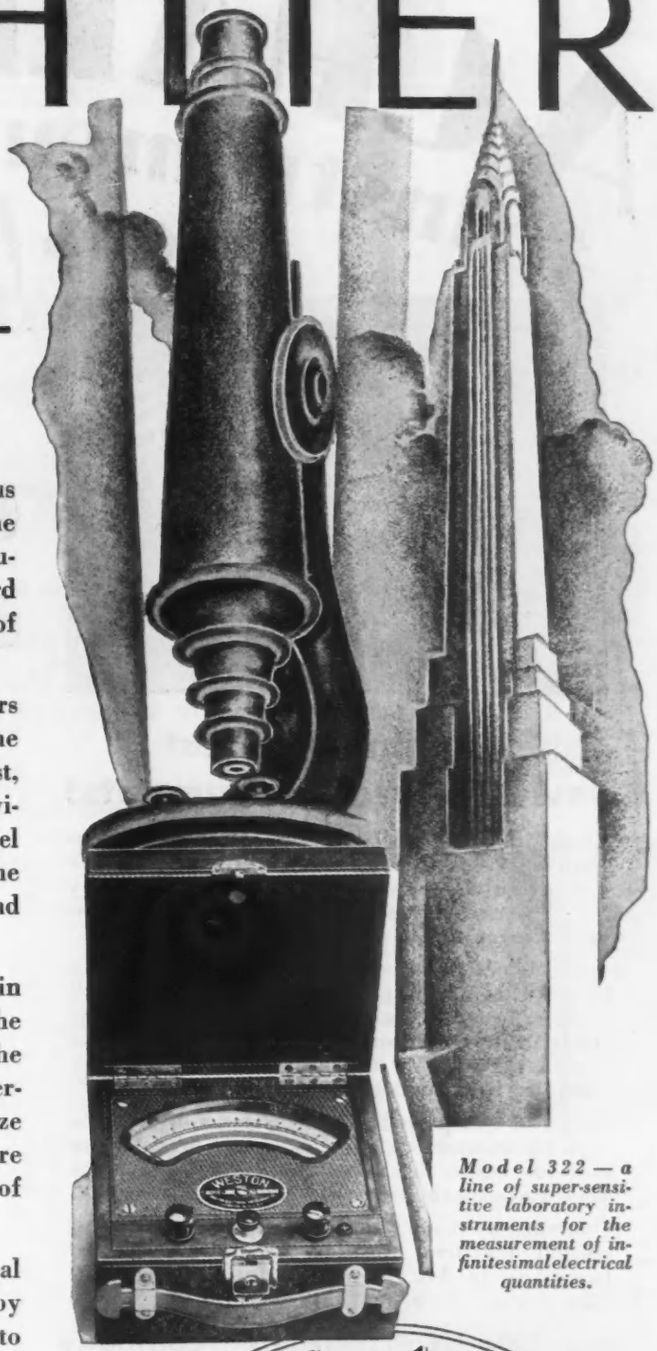
There is nothing more easy to claim, nor more difficult to maintain, than Quality. Yet Newton Quality is tangible, if the evidence of a maintained enthusiasm on the part of old customers carries weight. Continued preference with experienced buyers and the increasing number of new customers justifies our confidence in the soundness of our adherance to the standards of quality and service which have established the name Newton as having a definite meaning.

The NEWTON DIE CASTING Corp'n.

146 Munson St. NEWTON NEW HAVEN New Haven, Conn.

MIGHTIER

than the COMMERCIAL MASTODON



Model 322 — a line of super-sensitive laboratory instruments for the measurement of infinitesimal electrical quantities.

IN a recent radio broadcast, Dr. Julius Klein characterized the 1920's as the "Startling Era," a decade of spectacular economic advances transcending the record of any other ten-year period in the history of the world.

The amazing developments of recent years in all fields are attributed by Dr. Klein to the entry upon the scene of the research scientist, or laboratory worker. It is because of his activities that business has progressed from the level of mere bartering in staple necessities to the higher planes of diversion, entertainment and cultural enrichment.

Industry is sensible of this influence and in consequence, as Dr. Klein expresses it, "the test tube has become more potent than the desk, and the atom mightier than the commercial mastodon." For modern executives realize that the towering business structure can endure only by being built upon a solid foundation of scientific operation.

And in this work it is the art of electrical measurement, founded and developed by Weston, that science is increasingly calling to its aid. Moreover, as industry expands and *the atom of activity* in economic production assumes greater importance, it is the accuracy and dependable service of Weston's world-standard instruments that science more and more demands for that certain knowledge of fundamental facts upon which continuous progress rests.

Weston
PIONEERS SINCE 1888
INSTRUMENTS

WESTON ELECTRICAL INSTRUMENT CORP.
582 Frelinghuysen Ave. Newark, N. J.

A CHALLENGE to Instrument Users!

Examine and test Jewell Master Instruments!

These instruments in bakelite cases of uniform dimensions not only form the most complete line of intermediate size instruments — they have features of improved design not found in other instruments of comparable size.

Tests by central station companies and other large users of instruments have given Jewell Masters excellent ratings. They are used extensively in many factory laboratories. An increasingly large number of manufacturers are using them for field service.

Test and compare Jewell Masters side by side with instruments of similar size. Careful tests and close inspection reveal the accurate performance and superb design of Master Instruments.

Instrument users should be familiar with the special features afforded by Jewell Master Instruments. Ask the nearest Jewell representative for a demonstration.

Important Features of No. 173 Jewell Master Wattmeter

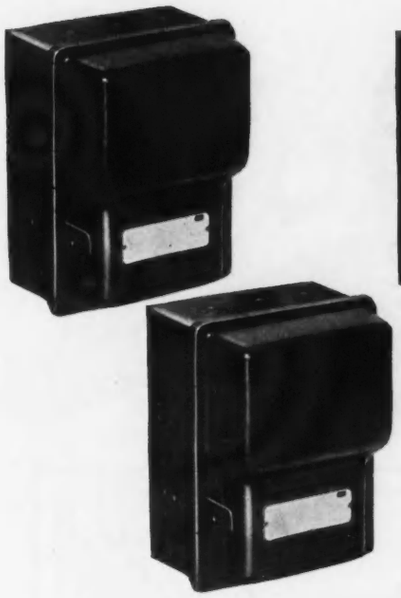
1.—Bakelite Case (Complete line has cases of uniform size).
2.—Scales much larger than on competitive instruments.
3.—Shielded against external magnetic fields.
4.—Large scale opening prevents shadows.
5.—Non-shatterable glass window.
6.—Accuracy of ½ of 1%.
7.—Current carrying binding posts of improved design.
8.—Special connectors eliminate metal links.

The Jewell Pattern 173 is typical of Jewell Master Instruments available in both A. C. and D. C. voltmeters, ammeters, and wattmeters to cover practically every requirement of electrical testing.

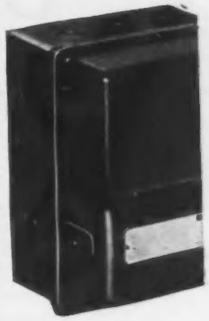
Jewell Electrical Instrument Company
1650 Walnut Street, Chicago
Manufacturers of a Complete Line of Portable and Switchboard Instruments

30 YEARS MAKING GOOD INSTRUMENTS

JEWELL



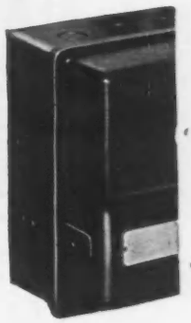
STAMPING ECONOMIES that Help Win in Competitive Sales Situations



WHETHER you maintain your own stamping department, or farm out stamping work, G. P. & F. is in a position to offer still greater stamping economies. During peak periods, you can secure stampings from G. P. & F. cheaper than you can prepare to make them. And you may find that G. P. & F can underbid your own plant or other sources of supply on any job.

The 19-acre G. P. & F. plant, equipped with the very latest time-saving machinery, manned by 1500 skilled workmen—and G. P. & F.'s enormous purchases of raw material—all combine to effect stamping economies. And G. P. & F. capacity of over 100,000 parts daily is your assurance of prompt deliveries under any and all conditions.

Besides, you have at your disposal an engineering staff backed by 49 years' experience in pressed metal work. They can assist you, as they have innumerable other manufacturers, in solving intricate stamping problems—in helping you get new products ready to sell without lost time. Why not let G. P. & F. quote on your requirements? Send a sample or blue-prints. There is no obligation.



This dust-tight case for a motor starter is produced complete by G. P. & F., ready for installing the starter mechanism. Thus assembly costs are radically reduced.

GEUDER, PAESCHKE & FREY CO.

Sales Representatives in Principal Cities in All Parts of the Country

1392 St. Paul Avenue, Milwaukee, Wis.
370 W. Ohio Street, Chicago, Ill.

G.P.&F. STAMPINGS

GEUDER, PAESCHKE & FREY CO.

1392 St. Paul Ave., Milwaukee, Wis.
370 W. Ohio St., Chicago, Ill.

Please send your 1930 Booklet, "In Harmony with Modern Progress," to the address below. It is understood the writer is not obligated.

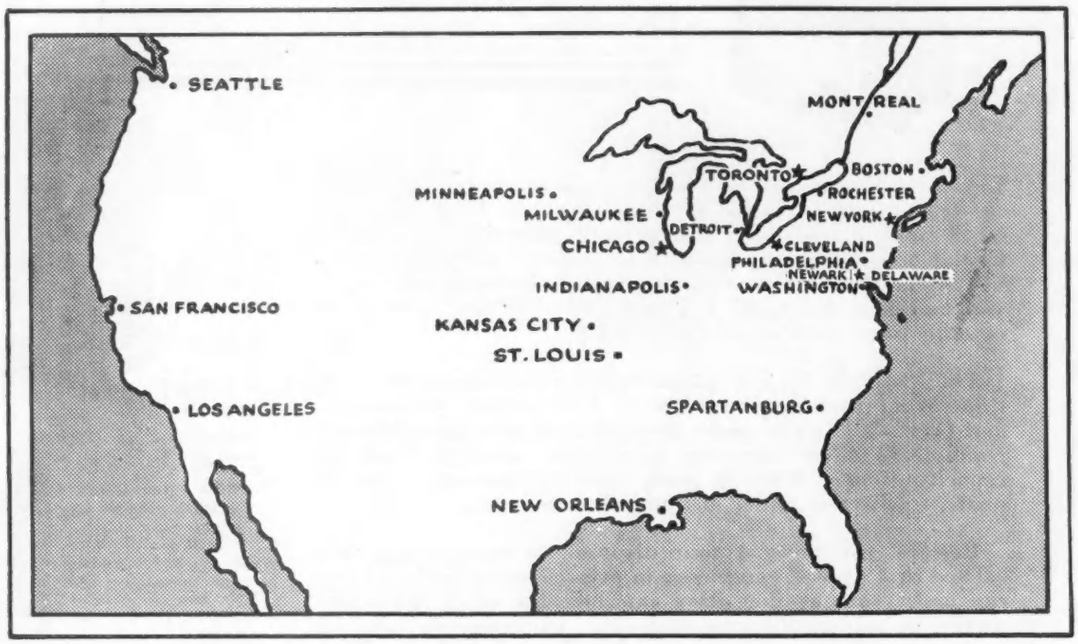
Name _____

Company Name _____

Address _____

EVERYWHERE

CONTINENTAL-DIAMOND SERVICE TO GIVE IMMEDIATE ATTENTION TO ALL YOUR INSULATION REQUIREMENTS



Stocks of DILECTO and DIAMOND FIBRE insulating materials and CELORON gear material are carried in the cities starred on the map above. Black dots indicate branch sales offices.

In the cities in which we have warehouse stocks, we also have fabricating shops where you can get immediate service on your requirements for fabricated parts from Dilecto, Diamond Fibre and Celoron materials.

These service facilities make it possible for us to give the same attention to small orders as to large orders. Where a manufacturer does his own fabricating, we are in position to give him excellent service on his requirements for sheets, rods and tubes.

CONTINENTAL-DIAMOND FIBRE COMPANY

Manufacturers of Dilecto—Diamond Fibre—Celoron

NEWARK, DELAWARE

LOS ANGELES, CAL.
SAN FRANCISCO, CAL.
SEATTLE, WASH.
KANSAS CITY, MO.
MILWAUKEE, WIS.
ROCHESTER, N. Y.

CHICAGO, ILL.
CLEVELAND, O.
BOSTON, MASS.

NEW YORK, N. Y.
SPARTANBURG, S. C.
PHILADELPHIA, PA.

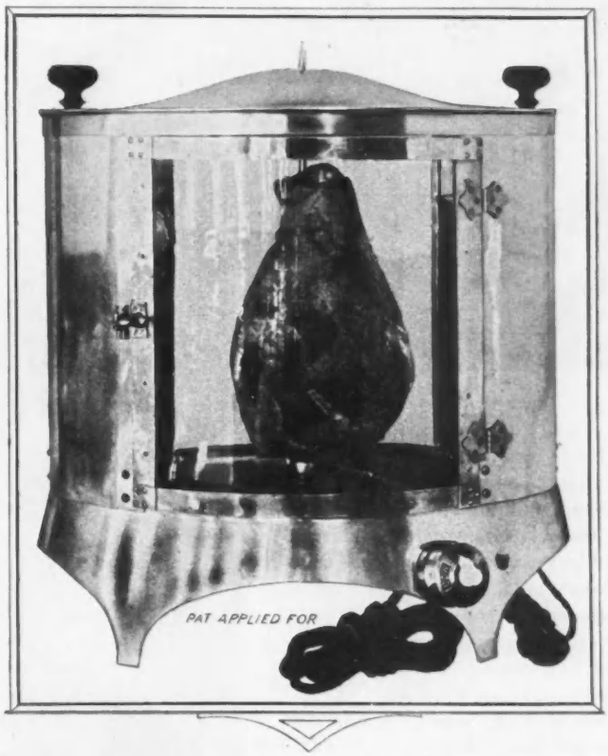
ST. LOUIS, MO.
WASHINGTON, D. C.
DETROIT, MICH.
NEW ORLEANS, LA.
INDIANAPOLIS, IND.
MINNEAPOLIS, MINN.

In Canada
DIAMOND STATE FIBRE CO. OF CANADA, LTD.
350 Eastern Avenue, Toronto

Globar BRAND

REG. U.S. PAT. OFF.

Another Evidence of the Versatility of these Non-Metallic Heating Elements



THIS Rosticceria was designed and built by the S. A. X. Safe-T-Fan Corporation, Buffalo, N. Y., in collaboration with Globar engineers.

Two chromium plated parabolic reflectors are employed—one at each enclosed end of the machine. A Globar Brand Electric Heating Element is mounted vertically in front of each reflector, and the reflectors are so focused that the direct radiant energy impinges upon the roast, which is rotated through a gear reduction operated by a three-coil, split-phase, induction motor mounted under the base.

The Globar Brand Heating Elements are 12″ long, ⅜″ in diameter, rated at 110 volts, 900 watts, making a total of 1800 watts energy input.

The radiant energy delivered by the two Globar Brand Electric Heating Elements sears the surface of the roast and seals in the natural juices.

This Rosticceria cooks a 16-lb. fresh ham roast in four hours and forty-eight minutes, or only 18 minutes to the pound. The average electric oven requires twenty-five minutes to the pound.

A "Pyrex" door and window make the interior of the machine visible at all times.

A grill is also furnished on which steaks and chops can be broiled. The grill does not rotate, but is placed in such a way that the direct radiant energy from the Globar Brand Elements impinges on each side of it.

With these elements a clean, effective uniform, heat is quickly delivered. Replacement of new elements is simply a matter of seconds—just set them in between the Globar spring terminals. There are no servicing problems.

And so we have Globar making another device more efficient.

Globar Engineers will gladly assist you in working out new apparatus or in working over old designs.

GLOBAR CORPORATION, NIAGARA FALLS, N. Y.

(A SUBSIDIARY OF THE CARBORUNDUM COMPANY)

Pacific Abrasive Supply Co., San Francisco and Los Angeles

Williams & Wilson, Ltd., Montreal—Toronto, Canada

Steinmetz & Company, Philadelphia

(Globar is the registered trade name given to non-metallic electrical heating and resistance materials, and to other products of Globar Corporation, and is its exclusive property.)

Why should WE *use typewriters?*

People can read my writing all right!

FORTY YEARS ago typewriters were a doubtful luxury for most businesses. They cost a lot—why not let the clerks do all the writing by hand?

But not today! For we have learned that typewriters make possible *more* business—at lower cost. Forty years ago it took imagination to see that!

Are you still *finishing* your product by "long hand" methods? Perhaps out-of-date processes and false economy "cheap" materials are slowing *your* progress and eating *your* profits—today!

This message is to men of vision—who are willing to look for widened markets and labor-saving economies, shrewdly figuring that a new finish which may cost a few more cents per gallon may save dollars on the payroll and thousands at point of sale.

To such men, Egyptian Lacquer offers the consultation of experienced and practical finishing men—and research facilities that have solved some of the knottiest finishing problems that ever troubled a treasurer's checkbook!

EGYPTIAN LACQUER CO., 90 WEST ST., NEW YORK

It won't cost me anything to *find out* if you have anything I can use. Shoot!

Name.....

Address.....

THE EGYPTIAN LACQUER MFG. CO., 90 WEST STREET, NEW YORK CITY

Branches in charge of practical men *maintained in*

ATLANTA BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DALLAS DETROIT KANSAS CITY LOS ANGELES PHILADELPHIA PORTLAND, ORE. SAN FRANCISCO SEATTLE SPOKANE ST. LOUIS

The Maker Who is PROUD of What He Makes, Uses Egyptian Lacquer

Users of Magnet Wire

Have you seen samples of the new

ROCKBESTOS MAGNET WIRE?

It is an asbestos insulated magnet wire, with a uniform diameter no greater than double cotton covered magnet wire—

Sizes 15 B & S gauge and smaller—at a price much lower than heretofore.

THE superiority of asbestos insulated magnet wire has already been demonstrated.

A new Rockbestos process has brought about lower prices for magnet wire, which makes asbestos insulation possible for general use.

With this new Rockbestos Magnet Wire, you can now build into your product, longer life, continuous service and dependability without redesigning.

This coupon will bring complete information. Send it today.

ROCKBESTOS PRODUCTS
CORPORATION
367 Nicoll Street
NEW HAVEN, CONN.

942 Grand Central Term. Bldg., New York 903 Clark Bldg., Pittsburgh, Pa. 224 Madison Term. Bldg., Chicago
2143 Railway Exchange Bldg., St. Louis, Mo.
On the Pacific Coast—Anaconda Wire & Cable Co.

M
Rockbestos Products Corp.,
367 Nicoll St.,
New Haven, Conn.

Send samples and complete information about your new Magnet Wire.

Name .....
Title .....
Firm .....
Address .....

ROCKBESTOS

—the wire with permanent insulation

THE

With a history that dates back to the very beginning of the electrical industry, SCRANTON BUTTON experience needs no introduction to the electrical manufacturer.

SCRANTON

And, SCRANTON BUTTON plants are serving many other industries, as well, with accurate, uniform mouldings in Bakelite, Lacanite, Durite and Durez—each material selected for its peculiar adaptability to a specific need.

BUTTON

Any question involving production economies in moulding is assured of definite and *final* answer through SCRANTON BUTTON experience—we don't *guess* here, we KNOW and that answer is just as carefully compiled on a small moulding job as on a big one.

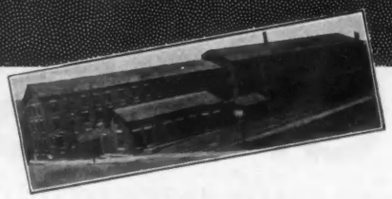
COMPANY

Let SCRANTON BUTTON prove that this experience is a *reality* by estimating on your requirements for accurate mouldings—immense facilities assure immediate attention to the job.

SCRANTON

The world's largest and newest-equipped moulding plants

Main offices and Plant, Scranton, Pa.



Auburn Plant, Auburn, New York

NEW YORK, N. Y.
50 Union Square

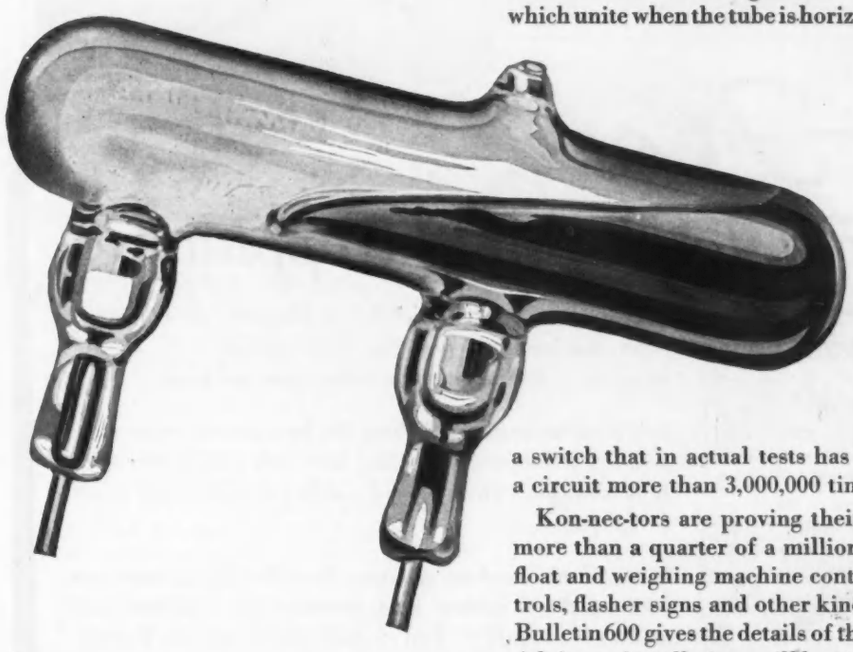
DETROIT, MICH.
114 East Lawn Ave.

CLEVELAND, O.
4900 Euclid Bldg.

CHICAGO, ILL.
645 Washington Blvd.

Once installed you can forget KON-NEC-TORS —they're dependable

SIMPLE construction of the Kon-nec-tor is a guarantee of long, dependable life. Enclosed in a tube of special hard glass made to resist sudden shocks of great heat and cold, are two pools of mercury which unite when the tube is horizontal. A slight tilt and the mercury divides, thus breaking the contact. The two inleads of pure tungsten are always surrounded by mercury, thereby ensuring long and uniform operation.



The Kon-nec-tor is a trouble-free switch because there is expert knowledge and years of manufacturing care behind it. The General Electric Vapor Lamp Company has been making electro-mercury products since 1903. These 27 years of experience have made the Kon-nec-tor a switch that in actual tests has shown that it can open and close a circuit more than 3,000,000 times without attention.

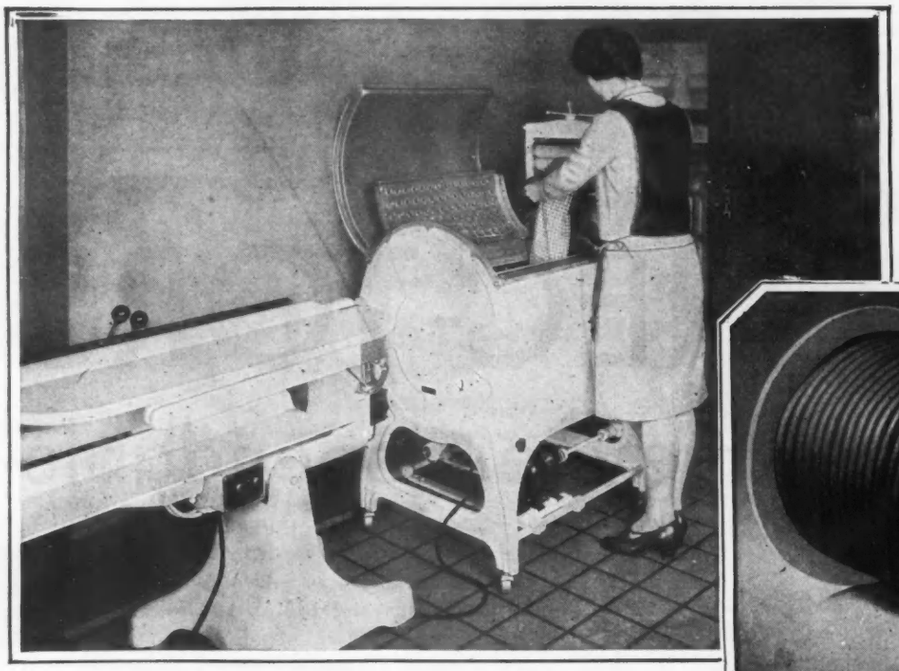
Kon-nec-tors are proving their sturdiness and dependability in more than a quarter of a million installations. Among its uses are: float and weighing machine controls, toggle switches, pressure controls, flasher signs and other kinds of automatic electric apparatus. Bulletin 600 gives the details of the Kon-nec-tor and many other uses. Advice on installations will be given gladly by any of our engineers. General Electric Vapor Lamp Co., 883 Adams Street, Hoboken, N. J.

The hard glass tube of the Cooper Hewitt Kon-nec-tor is noted for its great mechanical strength and heat resistance. Alternate sudden heating and cooling through millions of times shows little deteriorating effect. Its low co-efficient of expansion is practically the same as that of the tungsten inleads sealed in the glass—which makes for compactness and sturdiness.

GENERAL ELECTRIC VAPOR LAMP COMPANY

(Formerly Cooper Hewitt Electric Company)

431 © G.E.V.L., Co., 1930



G-E Flex . . . . . .

the electric cord for household appliances

Lighting *Household Appliances* *Construction Machinery*

Electric Drills *Garages* *Offices*

Washing Machines

Vacuum Cleaners

Manufacturers of household appliances, of lamps, of office machines, of portable electric tools . . . . all are adopting G-E Flex—the cord that does not kink.

G-E Flex has remarkably long life because it is extremely flexible, resists abrasion, and has high tensile strength. It is all-rubber covered and neither acid, oil nor water will harm it.

It can be obtained on spools or in coils, also in cord sets with moulded rubber plug, permanently attached and ready for assembly. The coupon will bring you further details.

Section WR-323, Merchandise Department,
General Electric Company,
Bridgeport, Connecticut.

Please send me full information on G-E Electric cord and Cord Sets.

Name .....

Address .....

.....

GENERAL ELECTRIC

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Electrical Manufacturing

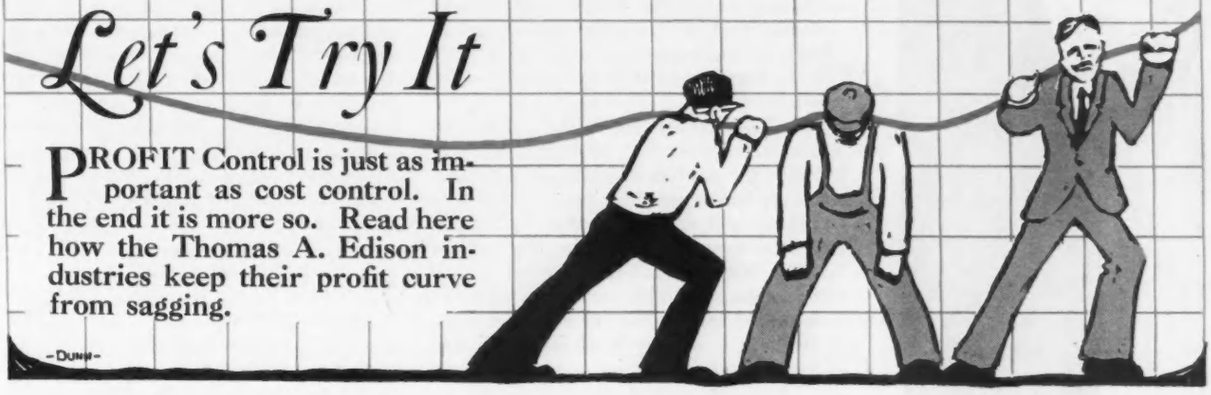
Production - Marketing - Administration - Repairing

Volume 5 MARCH - 1930 **Number 3**

Profit Engineering

Let's Try It

PROFIT Control is just as important as cost control. In the end it is more so. Read here how the Thomas A. Edison industries keep their profit curve from sagging.



By CHAPIN HOSKINS

BACK in 1838, when the engineer of a locomotive on the Boston and Providence railroad opened his throttle for the start of his run, he had only the vaguest notion of when he would arrive at his destination. "Within two and a half hours," his orders were.

And these were the conductor's dispatch orders:

The Steam Boat train from Providence will proceed with the greatest care; the Conductor will keep a good look-out, sending one of his Brakemen ahead to look round curves, if he have any doubt with respect to the vicinity of a train which may be expected approaching him. . . .

If, on the arrival of a train at a turn-out [siding], where a meeting with another train is usual, and the expected train has not arrived, the Conductor, after remaining on the turn-out fifteen minutes, will send a Brakeman forward with orders to proceed as rapidly as possible; he will carry in his hand the signal of a Brakeman, viz: a blue flag. If, in fifteen minutes after the Brakeman has started, the expected train shall not have arrived, nor the Brakeman returned, the Conductor will proceed with his train, moving with *care* and *prudence*.

Consider the difference today.

The driver of the great electric locomotive that pulls out of Harlowton, Mont., at 7.35 A.M., knows that he is due to pull into Three Forks at 10.50. He knows that in order to do so he should pass each of a number of checking points at scheduled times; that if he is a little late at one point he must increase his speed over the next stretch.

And somewhere, unseen by engineer and passengers, is the dispatcher. It is he who knows not only the whereabouts of The Olympian, but that of each other passenger train, and each freight. He knows how fast each can be expected to move, which ones must give way to others. Nine times out of ten he gets them all through on scheduled time.

Some difference!

* * *

How about business, and electrical manufacturing in particular?

Does it run 1838 Boston and Providence, or 1930 Chicago, Milwaukee, St. Paul and Pacific fashion?

The specific goal of any electrical manufacturing business is, presumably, profits.

But—take your own business, or any electrical business that you know—how much definiteness is there about reaching the goal? How much profit do you expect to make in 1930? How much of it will come from this department of the business, how much from that? What rate of growth do you ex-

SCHEDULING of profits and of development means working out a combination of the most desirable and the most probable course of events. It means collection and use of data; planning and carrying out plans; check up on variations and consequent correction, either by change of action or by change of schedule. It means getting the most desirable profits possible, by definite action intelligently planned and effected and controlled. It is nothing more nor less than profit engineering.

1838

There were no train schedules. "The Conductor will keep a good look-out," the orders read, "sending one of his Brakemen ahead with a blue flag, to look around curves"

pect, for the profits of each department and for the whole business, in 1931, 1932, 1933? Where is speeding up necessary, and what department, if any, must give way to others if total net profit results are to be on schedule?

If this were 1838, or even 1918, these questions might not be particularly pertinent.

But it is 1930.

And this, I think, is what 1930 means to the manufacturing business:

There is no particular reason why merely changing the decade should call for a revision of management standards. But it sometimes works that way.

It happened that the 1920's were ushered in by a boom-and-slump that many manufacturers do not find it pleasant to remember. But unquestionably the experiences of those years have colored management policies ever since—particularly in the respect that most of us have set up better standards of inventory control.

And now come the 1930's, ushered in by a little opportunity to do some serious thinking. And most certainly management will do some thinking.

What will be the characteristic management development of the '30s? This, it is a fair guess: that business is going to be run more and more by prediction and by schedule. We are going to set in advance our standards of profit, of volume, of cost, of quality, and then direct our energies toward meeting these predetermined schedules.

In 1820, Faraday knew he could produce continuous rotation about each other of magnets and current-conducting wires, but that is about all he could predict of the consequences of setting up opposing electrical fields. Today, however, any experienced motor designer, can, from a set of blue prints and specifications, calculate within close limits, the performance to be expected from a given motor. Since Faraday we have accumulated experience, data, and theory from which we can predict with practical accuracy the action of almost any known electrical device.

IN business, the trend has been the same. Here, too, experience, data, theory, have combined to make predictability a real possibility.

A manufacturer who could not with confidence predict motor performance, or panel board performance, or washing machine performance, would not get very far today. In time, what is true of product performance will be true, no doubt, of profits. Meanwhile, for 1930, 1931, 1932, and the ensuing years, this much can be said: The electrical manufacturer who does schedule his profits is going to go lots farther than the one who does not.

"Oh, yes?" says someone. "In the electrical business there is too much change, too rapid technical advance, too much introduction of the unexpected. You *can't* schedule your profits."

Let's not forget that out on that 440-mile stretch of electric engine travel on the Chicago, Milwaukee, St. Paul & Pacific there are sometimes blizzards, terrific rainstorms, and, perhaps, landslides. There are times when traffic cannot by any known means be made to follow normal schedules.

Yet who would advocate no schedules at all? Who wants to send the brakeman around every curve with a blue flag?

Scheduling of profits and of development means working out a combination of the most desirable and the most probable course of events. It means collection and use of data; planning and carrying out plans; check up on variations and consequent correction, either by change of action or by change of schedule. It means getting the most desirable profits possible, by definite action intelligently planned and effected and controlled. It is nothing more nor less than *Profit Engineering.*

* * *

THOMAS A. EDISON industries have scheduled both their profits and their rate of development for a number of years now.

Said Thomas A. Edison, at the start, to Ralph H. Allen, vice-president:

"I notice this covers 12 months ahead. That is a long time. Watch out that your forecast doesn't get so long it sags in the middle."

Actually, over a period of years, the forecast of profits has averaged 95 per cent correctness. In the spring of the year, the public knows what Edison profits were the year before. Charles Edison, president of Thomas A. Edison, Inc., could have given you the figures 14 months sooner—with negligible error.

And this in spite of the fact that Edison industries comprise radios and radio-phonograph combinations, portable phonographs, storage batteries, Portland cement, primary batteries, electric-motored dictating machines, toasters, coffee siphonators, juvenile furniture, card tables, stock tickers, relays, and precision instruments. A wide variety of electrical and non-electrical products, each subject to a different set of competitive conditions, raw material markets, price trends, and manufacturing problems.

The success of Edison profit engineering is, in large part, due to the fact that it does take cognizance of the different circumstances surrounding each angle of the business. It builds from the bottom up, not from the top down. It is by no means a matter of saying, "Well, we must make 10 per cent on our investment this year, and every department must figure accordingly."

The Edison profit budget starts with some pretty solid thinking by departmental executives, the executives who will be responsible for earning the profits after they are scheduled. And that, indeed, is one of the budget's greatest values. Two or three months before time for the presentation of his budget, each departmental manager is thinking, thinking, thinking. How much can we sell next year? What will it cost us? How much will be expected of us? If we set our figures high, can we be sure of making them?

The departmental manager sets his own subordinates to thinking, too. He wants to know what to expect from each sales territory, and may even require the local men to set down what business they expect from each important customer. He checks up on manufacturing probabilities, too, and on raw material trends. And, of course, he considers selling prices.

From his own knowledge; from data of previous years; from information, suggestions, and opinions given by other members of the organization; from actual income and cost figures; the manager obtains for this department a budget of profit, sales, and production for the coming year.

This departmental budget the manager delivers to Vice-president Allen, who is director of the budget for the whole organization. After a certain amount of study and checking, including an examination of proposed inter-company transactions, Mr. Allen discusses the budget with President Charles Edison.

ONE thing that will be taken up in this conference is the percentage of profit that is forecast. I have said that no definite percentage is set out in advance to which all departments must conform. But the company officials do have, for *each* department, a predetermined standard of earnings percentage. This percentage is, of course, based on previous experience, on the records other departments are making, on general business experience, and on business conditions.

Two things are to be noted:

One, that there is a different percentage of profit for each department. The other, that these predetermined percentages are used for a check on the manager's plans, not given out to him in advance as a standard he must meet.

Suppose that one department of the business is in particularly favorable position to earn 20 per cent on invested capital. Suppose, then, that the manager submitted a budget anticipating 18 per cent. The president and vice-president, in conference, may decide that 18 per cent is acceptable, and approve the budget.

Suppose, instead, that the department manager has submitted a schedule which will produce only a 10 per cent return. Now 10 per cent might be a wholly acceptable return for some other branch of the business, but because of the opportunities in this particular case, and because of the necessity for providing for its rapid development within the next few years, 10 per cent for this department seems wholly inadequate.

In such a case it is likely that the manager would be asked to discuss his figures with the president. Details of selling prices, manufacturing and distribution costs, and volume, would be gone into, and the manager's reasons for his decisions brought out. Top management would be open minded, and would expect him to be so, too. Both would be seeking the proper solution of the problem.

AND any of three obvious solutions might be chosen. The manager might be given definite instructions to bring his schedule of profits into line, and be shown how he could do so. Or a compromise might be reached. Or the president might see that the manager's plans were sound and based on reliable data, and agree with him that this was not a year in which the full profit could be expected.

The main point would be that all these differing viewpoints would be brought out at the start of the year—instead of as alibis and recriminations at the end of the period. An intelligent decision would be made, and the departmental manager would go ahead with full knowledge of what was expected of him. Naturally, he is much more likely to get his results.

The question of percentage of profit might also come up as a percentage of profit to sales. Out of every dollar to be taken in, the manager might indicate a profit remainder of ten cents when top management had in mind twice as much.

A second, and very important, ratio which is scrutinized by the president and vice-president of the Edison industries is rate of growth.

Comparison with last year's figures has a tendency to make some managers develop a static point of view. They compare volume, quality, costs, not with what they might be, but with what they were last year, and the year before.

But static does not make a happy noise. The business that stands still goes backward. And so it is necessary, occasionally, to get a manager to agree to revise upward his plans for development.

On the other hand, it is also sometimes necessary to ask the ambitious department to go a little more slowly. Top management may see the necessity for developing a stronger organization before certain steps are taken, or of giving a new product a longer tryout, or of plowing back money into cost cutting instead of

1930

Some say, "In the electrical business there is too much change, too rapid technical advance, too much introduction of the unexpected. You can't schedule your profits." Yet who would advocate no schedules at all? Who wants to send the Brakeman around every curve with a blue flag?

into sales development. It may realize the importance of a department's getting over its present growing pains before acquiring another set.

Revision downward comes most often, of course, in the case of an overoptimistic sales manager.

A few years ago one Edison sales manager presented a sales estimate for the ensuing year of four times the volume of sales he had made in his best previous year.

Obviously, the higher officers were faced with a management decision of real importance. Should they accept these figures, and build their budget accordingly? If they did, the results might be exceedingly embarrassing if no such abnormal increase developed. On the other hand, to say to the sales manager that he hadn't a chance on earth of making such a record would perhaps kill the enthusiasm which might, after all, hold possibilities of such a performance.

IN such a case the head profit engineers show both sides of their problem to the man himself.

They point out to him that acceptance of his figures as official would mean building up manufacturing expense and reserves, providing money for increased manufacturing facilities, quadrupling the advertising budget, taking on additional help, in factory and office, and telling the treasurer that he could count on much greater collections than ever before. Obviously, to do all this would be very unwise indeed, unless there is pretty good assurance that this four-to-one optimism is justified.

It is important to have the sales manager realize that the officers have full confidence in him, and that they consider his estimates may indeed represent real possibilities. So they ask for his basic data in detail, not to prove him wrong, but to find out whether there is real justification for the company committing itself to all these important steps. It is in such cases that they may even go so far as to ask for branch managers' estimates of the amount of business they expect to sell to each important customer.

The end is, of course, a clear understanding on both sides that each will follow his own standards.

"Four times your best previous sales? By all means make them, if you can. More power to you! Let the new figure be your own sales quota. But for the present we, as profit engineers, must make our figures on a more conservative basis. We will keep in close touch with you, however, and watch the reports of your sales as they come in. If your business takes a sudden spurt, we will then revise the budget to take care of you in every way possible."

Is it not precisely in failure to draw the line between possibilities and probabilities, between targets to shoot at and the probable actual score, that most so-called budgeting fails to be true profit-planning? A sales manager, optimistic by nature and more effective because he does aim high, is permitted to put his stamp on the production, financial and cash plans of the company. The result is either that the budget is not taken seriously, and nobody carries out its provisions, or else that it is taken seriously and soon comes to grief.

The sales manager's estimate is a budget of hopes. He is forecasting a full house on the basis of the three of a kind he already holds.

But profit plans must not rest on possibilities but on probabilities. It is exactly because they get an entire organization working toward probabilities that profit plans produce consistent profits.

In the Edison organization every sales manager has a sales bogey higher than the sales estimate upon which production, expense and cash estimates are based. The sales manager, in turn, often has his district managers and their salesmen working on higher quotas than his own. Some make their quotas and some do not, and he comes out with the right average, or better.

And the sales manager himself, through this year-by-year education that comes from working out his problems with the director of the budget and the president of the company, finds that it is possible to be perfectly sane in working out official estimates for coordination with the rest of the organization, without having to restrain the dreams and the belief in dreams which, after all, produce sales results.

A similar distinction between probabilities and possibilities must be made in manufacturing estimates, with the profit budget standing for probability.

Suppose that an engineering study has shown that a manufacturing department is operating at only 60 per cent of the efficiency which may be obtained. A new standard of 100 per cent might be set for this department in the operating control, with the expectation that continuous check-up will gradually raise the standard of individual output until the ideal figure is obtained.

BUT would this new standard enter into the budget? Not in the Edison industries. Plans for profit must in such a case be based on what the past has demonstrated as an attainable performance, the old 60 per cent, with possibly a moderate allowance for some improvement resulting from the engineering study. If the department actually does come up to 80 or 90 per cent within the year, so much the better. And holding the budget of expectations at or near the old level of performance in no way limits the imagination or the ambition or the achievement of the production executives.

Were an important mechanical improvement to be introduced into a department, or the entire layout changed by the introduction of new means of mechanical handling, the case would be different. Here, obviously, past records may not serve. But even here the budget must represent probabilities, not hopes.

For the Little Fellow, Too

CAN profit engineering, such as this, be of value to any but a large and diversified manufacturing business such as the Thomas A. Edison industries?

By all means. It is just as possible and just as profitable and just as necessary for the small business to look ahead as for the large business. It is just as valuable for the different members of a small organization to learn how to coordinate their efforts with the efforts of others, with a specific profit goal in mind.

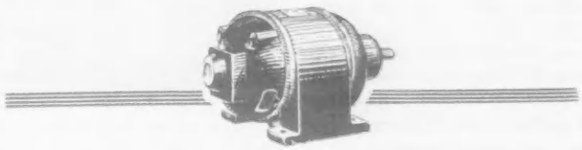
It is even more necessary for many small businesses to raise their heads above the details of daily problems and have a definite profit goal in sight than it is for large businesses.

Intelligent Motor Selection

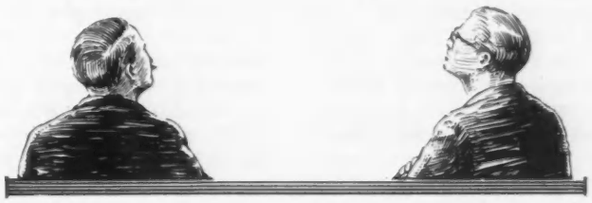
By Harry D'Almaine

Assistant Sales Manager
Bodine Electric Company

THERE is more to applying a motor to a piece of machinery than merely satisfying the engineering requirements. True enough, opinions differ as to what is the best type of motor to apply under a certain set of circumstances. This difference of opinion, which usually occurs not between motor application engineers, but between the machinery manufacturer and the motor manufacturer, results, sometimes, in a compromise being made with sound engineering principles in order to meet sales requirements affecting the machinery manufacturer.



THERE is a consistent and economically sound principle involved in the attempt upon the part of motor makers and machinery manufacturers to use standard motors wherever possible and this cooperation has brought about the building of better motor driven machinery and appliances



These sales considerations are constantly occurring and influence, to a large degree, the type of motor selected. Let us take up the various considerations for separate discussion.

First, there has been and probably always will be, on the part of machinery manufacturers, an effort to get as much horsepower output from a given sized frame as it is possible to do. There is a very simple reason for this. Naturally the effect from a design standpoint would be an increase of efficiency, while from the machinery manufacturer's standpoint it is principally a question of incorporating the motive power into his machine with as little space as possible allotted for it.

It is a matter of convenience and ofttimes affects the saleability of his product if he can reduce the size of the space in his machine that must be given over to mounting the motor.

The second consideration from a machinery manufacturer's standpoint is the question of price, as naturally he does not expect to pay as much for a small motor as for a bigger one.

The effect of the insistent demand for as much power as possible from the smallest mass of material has influenced the entire motor industry. This has resulted not alone in improved methods of construction that have increased efficiencies, but has had a practical influence upon determining the operating temperatures that motors would be allowed to rise to over and above a stated room temperature.

With a given size frame there is one way of getting more power out of the motor than its rating states it is good for, and that is simply to put additional load on it. Every motor is physically able to carry a load in excess of its rated capacity, but if it does so, the temperature limits that the manufacturer has determined it will rise to when operating under its stated load will be exceeded. If it were possible to design motors to operate at 70, 80 or more degrees Centigrade above normal room temperature, it would then be possible to get more horsepower output from given sized frames than is possible under the present practical restrictions of 40 deg. C. rise for a motor operating continuously at full load and under normal conditions.

On the other hand, every motor manufacturer is constantly educating the motor buying public, or a good portion of it, to appreciate the fact that the operating temperatures, as now determined, are entirely safe and are not to be criticized because the human hand is not tough enough to bear comfortably being held on a motor operating at 40 deg. C., above a maximum allowable room temperature of 40 deg. C. This is a total equivalent temperature of 176 deg. Fahr. The albumen of eggs coagulates at 198 deg. Fahr., so this gives some measure of the relationship between the safe operating temperature of a motor and the temperature the layman recognizes as being quite hot.

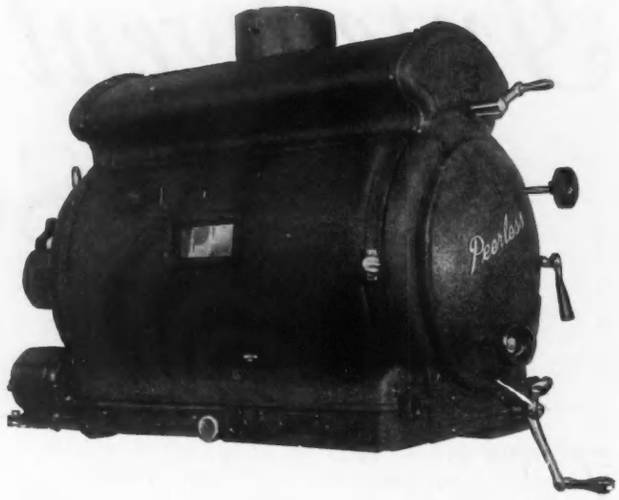
Scientific improvements in insulations have permitted of electrical machinery being able to stand these, and even higher temperatures, quite safely under continuous service.

There is a consistent and economically sound principle involved in the attempt upon the part of motor manufacturers, and machinery manufacturers, to use standard motors wherever possible. Standard motors are understood to be motors of conventional design that can be mounted on a flat bed-plate, usually in a horizontal position, and with certain standardized shaft extensions. There is an attempt at standardization of motors operating in a ver-

tical position also, but usually these are more inclined to require special features in their construction.

There are a large number of cases, and always will be, where motive power is needed in a special form, differing from standard design. Obviously, certain requirements of service can be better met if the motor is built to meet the specific needs of that service, both from a mechanical as well as an electrical standpoint, and inasmuch as motors are a pretty well standardized item in their essential construction, and require very little servicing, usual considerations relative to the use of special products do not so well apply.

Most manufacturers are capable of supplying repair parts from stock at all times, even on motors involving old designs going back fifteen or twenty years. The repair of such apparatus usually does not take long in the hands of the manufacturer or of a competent motor repair shop. The work is quickly and skillfully done.



Where special motors are to be designed, the manufacturer should satisfy himself that there will be no question of inability to get alternating current and direct current motors interchangeable in the same frames. Most motor manufacturers can meet this requirement, but it should be definitely ascertained to the satisfaction of all parties, as it is a very important point.

If standard motors are used, even though one manufacturer may not make motors for both currents, the standardization of motor designs permits of one make of motor being used for alternating current service and some other make for direct current service.

In deciding whether to use a standard motor or one of special design, it should be understood by the machinery manufacturer that special designs involve a considerable expense in the motor manufacturer's engineering department, to perfect the design, to have the drawings made and finally patterns and sample units. Where this is done the cost of development work should rightfully be borne by the machinery manufacturer, especially if there is no possibility of the motor manufacturer selling that particular design elsewhere.

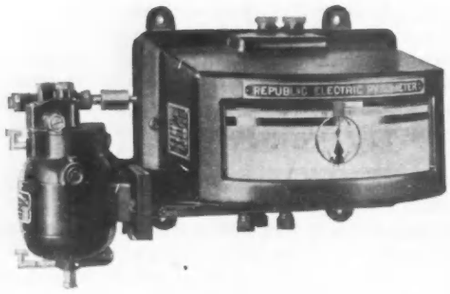
Whether it is practicable to design a special motor at all depends upon the quantities involved. The motor manufacturer should not be expected to develop a special motor where the possibility of subsequent sale is in doubt by reason of the sales plan not being developed to market the machine when completed, or where there is not a sufficient guarantee of good credit standing.

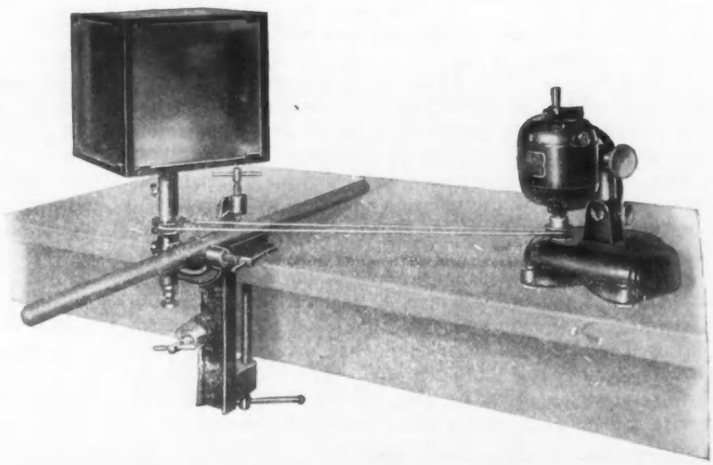
Whether or not to make a universal motor is a point of grave concern to most motor manufacturers. There are hundreds of small motor applications, especially in the home appliance field, in which the machinery manufacturer wishes to use one type of motor without regard to whether it is going to be used on alternating current or on direct current, and to meet this situation the so called universal motor is used.

It is obvious if only one type of motor has to be used that only the one type need be kept in stock, and sales can be made without regard for what sort of current the machines are going to be used on. It does not require any education of the selling forces to take account of the currents involved in different localities. Stock delivery with only one type of machine therefore becomes a simple matter. These are distinct advantages, but there is another side to the matter also.

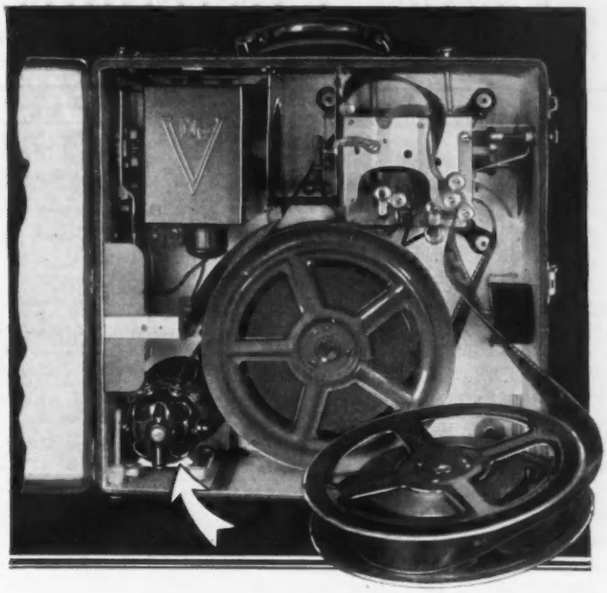
The universal motor is a series wound motor and is essentially a high speed motor. In service its speed is inversely proportional to the load. Under full load it can be wound to operate at a definite speed with adequate limits of tolerance allowed as between individual motors of course, but if the load is not a constant one, and few loads are, the result is that as the load decreases the motor speeds up.

A series wound universal motor on light load, or no load, will "race." That is, it is fundamental in its design that this motor will, under light loads, attain a very high and ofttimes a dangerous speed. The practical result is that the motor sparks badly and quickly wears out the brushes and commutator, requiring frequent maintenance. In addition it often results in the windings on the armature becoming loose, and by movement against each other, or





COOPERATION between motor manufacturers and machinery manufacturers is doing much toward the more intelligent application of electric motors to motor driven machinery and appliances

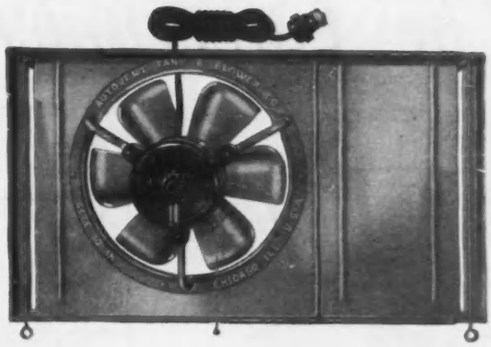


the iron armature core, breaking through the insulation causing shorts and grounds.

Most motor applications require constant speed characteristics. The machinery manufacturer overlooks an important element if he fails to consider that no two of his machines are identical. Each of them requires a different amount of power to operate. In some cases the variation may not be great, in other cases it may. The fit of the machine parts determines that. No matter whether this difference in power required is large or small, there are few cases where a universal series wound motor is used that it does not have a serious reflection upon performance.

These motors have a very sharp, and therefore sensitive, speed torque curve. Practically, this means that small changes in the power taken off from such a motor causes relatively large changes in speed.

IN the making of ventilating fans, motion picture machines, or laboratory equipment, there are specific problems involved in the application of the motor to the device, and the most suitable application can be made only when the motor manufacturer and the machinery manufacturer cooperate in the choice of the motor



Since speed plays a large part in the design and successful operation of most machinery it is a fundamental consideration. In fact in most cases it is all important. In this connection the universal motor often does not fill the bill. To the extent that the speed of operation varies, the result will be correspondingly poor.

The question of noise developed by the motor in operation is often of importance, and a universal motor, being essentially a high speed motor, develops considerable mechanical noise in the process of the brushes riding over the commutator. Brushes may be of different grades and sizes. Commutators may or may not be undercut.

These changes all affect the amount of noise developed, but frequently fail to eliminate it to the extent that the electrical manufacturer desires. Of course, there are some applications in which the universal motor can be used to advantage, both from an engineering, as well as a sales standpoint, but all too often good engineering is sacrificed for the sales and stocking advantages offered by the use of the universal motor.

Good engineering points to the use of a motor built for the job and the particular kind of current it will be used on. Where motors are designed to operate on a specific voltage and current, and where a constant speed is required, constant speed motors can be had without difficulty.

Even where some speed control is required, the stable characteristics of other motor types, as against the series wound motor, makes their selection usually advisable. No other motor but the series wound motor has such a sharp speed torque curve.

We believe that a large number of motor manufacturers besides ourselves, if they spoke the whole truth in every case, would strongly condemn the tendency to use a universal motor wherever possible rather than to use a motor especially built for the job and for the particular kind of current it must be used on.

The bad effect on sales by an improperly engineered job has a more insidious influence affecting the ultimate quantity sold than any corresponding good derived through the use of the universal motor. The advantage of the universal motor is easily seen, but the harmful effects of using the wrong motor are not so easily detected. In this case, the judgment of the motor manufacturer, with his long and varied experience, should be given the consideration it deserves.

Established trade practices among motor manufacturers and the weight of competition has, as a whole, divested the motor manufacturer of any guile in the matter of his recommendations. He is primarily a hard headed business man with well defined principles of conduct. The electrical industry, because of its professional associations, has determined ethical standards upon which it does business. Its primary object is to be of service, and service must be based on honesty. The motor manufacturer should not only insist upon furnishing the proper motor for

(*Continued on page* 84)

The Government Seeks Distribution

AS IS now generally well known actual field work on a national distribution census in connection with the enumeration of population and manufacturers in 1930 began about February 15, and the date of its completion depends in large measure upon the degree of cooperation received. This census is regarded as another step looking to the elimination of depressions, panics and high costs, through the use of statistical guides. Economists estimate a loss of upward of $9,000,000,000 annually through unnecessary costs arising between production and distribution of commodities, and it is thought the census will materially reduce this loss.

Form 19
DISTRIBUTION

GENERAL
RETAIL SCHEDULE

CONFIDENTIAL GOVERNMENT REPORT

DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
WASHINGTON

16—100
District Number
.....
Number of Report
.....

CENSUS OF DISTRIBUTION, 1929

Required by Act of Congress approved June 18, 1929

A separate report should be prepared for every retail store, or distributing agency. Combined reports for two or more establishments, even though under the same ownership, can not be accepted. All reports should relate to the calendar year 1929, or to the business year most nearly conforming to the calendar year.
Reports should, if possible, cover the full year's operation even if ownership has changed.
Under the law, no one not a sworn employee of the Bureau of the Census will be permitted to examine your report, and no information can or will be given out by the Bureau of the Census, either to other Government bureaus or to any individual, which would disclose exactly or approximately any of the figures in your report.

1. DESCRIPTION OF ESTABLISHMENT:

a. Name of establishment.....

b. Name of owner.....

c. Location of establishment { State ..... County.....
City, town, or village.....
Street and number.....

d. Is establishment located within corporate limits of city, village, or incorporated place? (Yes or No) .....

e. Post-office address of general office.....

f. Does this organization own or operate other establishments in this same line of business in this city? (Yes or No) .....
In this county? (Yes or No) ..... In the United States? (Yes or No) .....

g. Number of stores owned by this organization in the United States.....

h. Character of organization.....
(State whether operated by an individual, partnership, incorporated company, or cooperative association)

i. Is this establishment a member of a cooperative group? (Yes or No) ..... By contract? (Yes or No) .....
By license? (Yes or No) .....

j. Degree of service: Self-service? (Yes or No) ..... Cash and carry? (Yes or No) .....
Delivery service? (Yes or No) .....

k. Is this business owned or operated by Negroes? (Yes or No) .....

l. Give approximate date of original establishment of this business .....

m. Give approximate date when this business came under present ownership .....

2. DESCRIPTION OF BUSINESS:

a. Kind of business.....
(Give usual name or designation. *Examples* Hardware store, department store, women's clothing store, men's clothing store, hat store, shoe store, jewelry store, general store, etc. See "Instructions to Agents.")

b. Name principal lines of goods sold or handled in order of their importance based on selling value:

(1)..... (5).....
(2)..... (6).....
(3)..... (7).....
(4)..... (8).....

3. PROPRIETORS AND FIRM MEMBERS (Not applicable to incorporated companies):

a. Proprietors and firm members who *do not* receive a stated salary or commission—
1. Total number ..... Males ..... Females .....
(Report only those devoting all or practically all of their time to the business)

b. Proprietors and firm members receiving a stated salary or commission—
1. Total number ..... Males ..... Females .....
2. Total salaries and commissions received during 1929..... $.....

Since practically all of the information contained on this form will be of value to electrical manufacturers, it is expected that they can be of assistance in helping their various dealers, distributors and other outlets compile the necessary data for answering the different questions

No survey of this nature ever has been undertaken before in any country. Since there is no accurate knowledge of the value of commodities distributed annually, information as to where these losses occur and how best they can be prevented is wanting. It is thought that if proper cooperation of all concerned is obtained the census, now under way, will reveal the sources of these wastes and this is looked upon as the first step toward their elimination.

Distributors, as a rule, have not taken advantage of modern knowledge of business and have not been able to apply to their operations those scientific methods that have aided manufacturers vastly to reduce their costs. Eventual result of this activity would be to bring closer together producers and consumers, thereby bringing about a reduction in the cost of production and a lowering of prices of commodities to consumers.

From time to time ELECTRICAL MANUFACTURING has published information of value to electrical manufacturers and relating to the possibilities for them in the taking of this census. Such information has treated, in the main, of facts relating primarily to the census of manufacturers alone. However, there is another phase of the census that is of equal importance to them and this has to do with the part the retailer and the wholesaler is to play in this enumeration and collection of facts on marketing.

Manufacturers should be vitally interested in those who sell or distribute their products and it is for this reason that a brief outline is given of the information being asked from dealers and wholesalers in the taking of the census of distribution.

The forms shown herewith are being used by the Bureau of the Census to gather information from all retail stores, including electrical, in cities of more than 10,000 population. Electrical wholesalers and contractors-dealers will

Data from Manufacturers' Outlets

4. NUMBER OF PAID EMPLOYEES FOR SPECIFIED MONTHS, AND TOTAL SALARIES AND WAGES PAID:
(Report number of paid employees as of the fifteenth day or nearest pay-roll date, for each month. Do not include proprietors and firm members or their salaries. Hotels should include only employees connected with the business of supplying and serving food.)

	April	July	October	December	Present Time: Males	Present Time: Females
a. Total number of employees						

b. Total salaries and wages paid to all employees for the year 1929, or period covered by this report ..... $

	April	July	October	December	Present Time: Males	Present Time: Females
c. Number of part-time employees * (included above)						

d. Salaries and wages paid (included above) to part-time employees for the year 1929, or period covered by this report * ..... $

* NOTE.—Employees who work only part of the normal working day, and those who work only part of the normal working week, should be considered part-time employees.

5. RENT, if any, paid for premises during 1929 ..... $

6. INTEREST, if any, paid for money borrowed for this business during 1929 ..... $

7. ALL OTHER EXPENSES paid during 1929, not including wages, salaries, commissions, rent, and interest. (Do not include cost of goods purchased for resale) ..... $

8. STOCKS ON HAND FOR SALE:
a. Value of merchandise at cost or replacement value on hand December 31, 1929, or nearest inventory date ..... $

9. SALES OF PRODUCTS AND MERCHANDISE (Receipts from meals served by restaurants and hotel dining rooms should be reported under No. 13, and receipts from repair and service operations under No. 12, and **should not be included in this inquiry**):

a. Gross sales ..... $
b. Returned goods, discounts, and allowances ..... $
c. Total net sales (difference between a and b) ..... $
d. Give the total amount, if any, of credit sales included above ..... $
e. Give total amount, if any, of installment sales included above ..... $
f. If any of this merchandise was manufactured in this establishment, give selling value, f. o. b. plant, which should also be included in 9 a, b, and c, above ..... $
g. Sales made to other retailers (to be also included above) ..... $
h. Are sales of leased departments included above? (Yes or No) ..... (Inquiry 9, "Leased Departments," must be answered in either case.)

COMMODITIES	SALES	
14. Electric Appliances and Supplies (not including radios and radio equipment, see No. 38; see No. 3 for batteries and No. 27f for electric refrigerators), Total	$	$
a. Electric household ironing machines, washing machines, vacuum cleaners, and other motor-driven appliances, exclusive of refrigerators and oil burners		
b. Portable electric household heating appliances (including irons, percolators, toasters, grills, bowl heaters, etc.)		
c. Electric lighting equipment (residential, commercial, and industrial, including fixtures, portables, shades, reflectors, floodlights)		
d. Incandescent lamps (of all types)		
e. Electrical materials, supplies, and devices, used in interior electrical construction		
f. Commercial and industrial appliances (motor-driven and heating, including motors, control equipment, etc.)		
g. Electric ranges, water heaters, and other heavy-duty heating appliances, including air heaters over 1,000 watts		
h. Other electrical appliances and supplies		

Net sales for 1929 *should be entered on the form above. The number* 38 *in paragraph* 14 *should read* 39. *Paragraph* 27*f lists electric refrigerators under house furnishings*

also be interested in Forms 9, 10, and 14, which may be obtained from the Business Organization Service, Census Bureau, Washington, D. C.

Form 9 covers small retail stores of any kind in cities of more than 10,000 population. Form 10, wholesalers of all kinds, including manufacturers' agents and manufacturers' sales branches in cities of 10,000 or over. Form 14 has to do with wholesale, retail and other distributing establishments in rural districts and cities of less than 10,000 population.

Electrical merchandisers who cooperate to the full in providing the statistics desired will be taking a valuable part in the first nation-wide distribution census. Answers to the various questions are required by law, but the Census Bureau holds all such information in strict confidence from other departments of the Government and the public. Much of the information obtained will be made available in such form that individual questions are not revealed.

Hence, it is evident, that in addition to providing the necessary information asked of manufacturers, they can also assist by cooperating with their various dealers, distributors, agents and other outlets in the compilation of data and other information that will be of inestimable value to all concerned.

Four important uses to which this mass of information may be put are:

1—Individual business concerns can use the information to compare their businesses with the group average, nationally or locally.

2—Associations can use the information for the furtherance of their group interests.

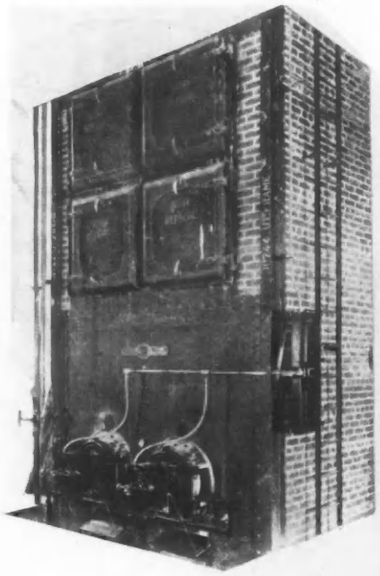
3—Manufacturers and their associations can use the information for national and geographical analysis of sales possibilities.

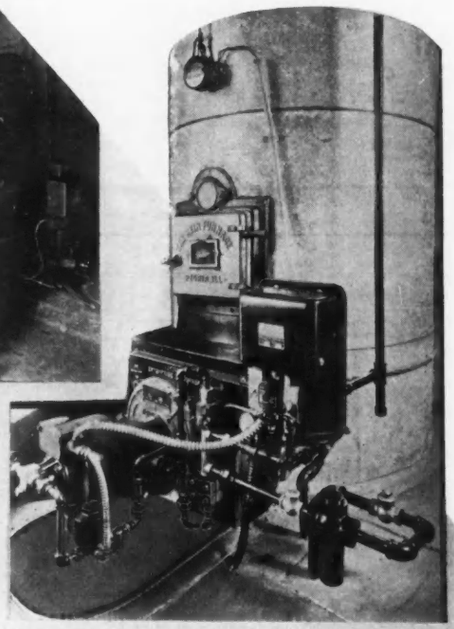
(*Continued on page* 60)

Here is a Market for

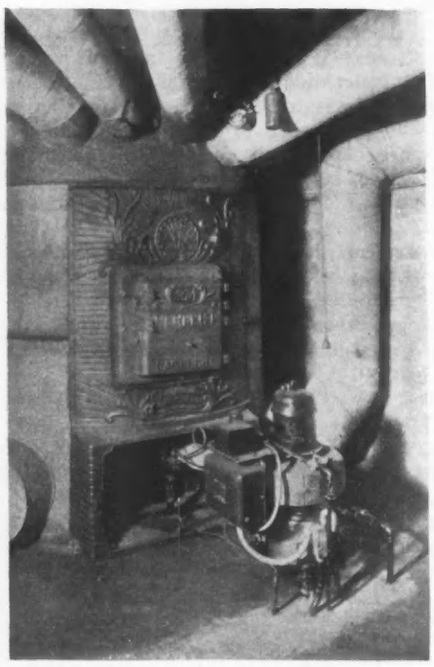
Automatic

SIMPLICITY, ease of operation, economy, cleanliness and mechanical perfection have contributed in large measure to the great extent to which automatic domestic and industrial oil burners are being used today. And with their installation there is building an ever increasing demand for many kinds and types of electrical equipment and materials. These include electric motors, control apparatus, wire, insulation, conduit and electrically operated thermostats. And, while the wiring and control installations are in a sense standard, the motors are of many kinds and sizes

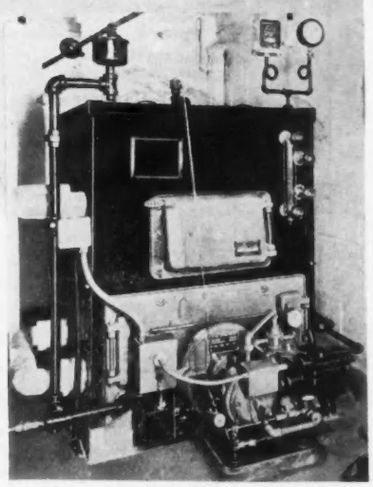




Probably the most extensive use of automatically operated oil burning equipment is in residences, although many of them are being installed in business and apartment buildings



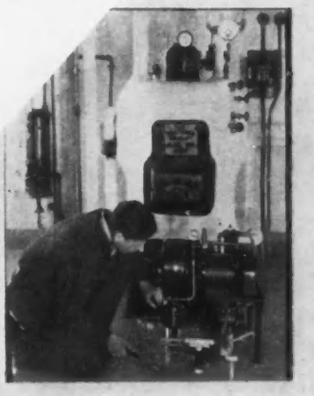
Usually the electric motors are mounted integrally with the mechanical parts of the burner and for this reason the motor frames form part of the burner itself. Several types of control are in use, some attached to the burner and some indirectly connected but usually remotely mounted near the burner

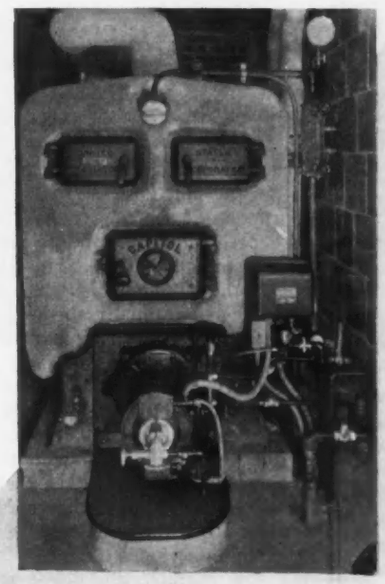


Electrical Equipment

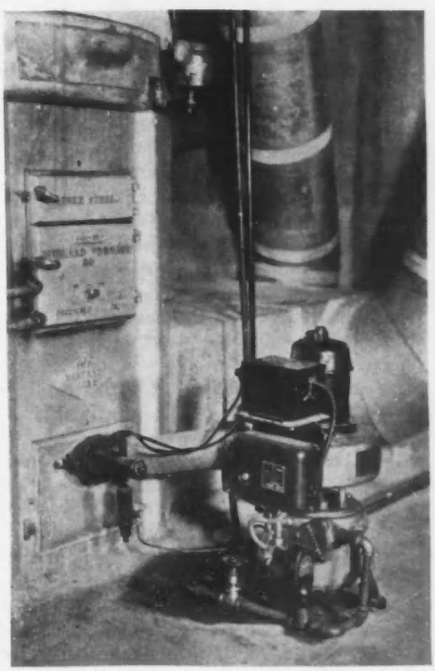
Oil Burners

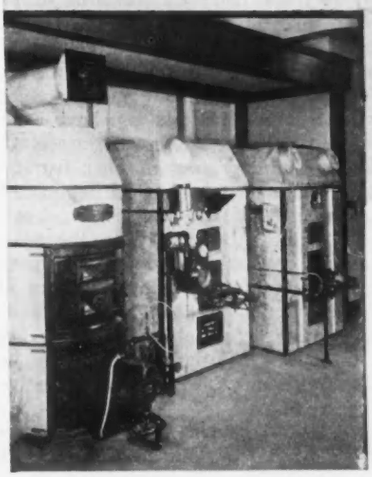
As an indication of the extent of the market for electrical equipment in motor driven oil burners statistical reports indicate that in the year 1929 upwards of 125,000 automatic burners were sold, having a retail sales value of more than eighty million dollars. This amount, of course, includes the cost of auxiliary apparatus and installation charges, yet there must have been manufactured last year more than 125,000 electric motors, switches and control devices, to say nothing of the tremendous amounts of conduit and wire that were needed to make these installations, and this market is growing daily





Aside from the market for electrical equipment in motor driven oil burners there is a great demand for many materials such as copper insulation, and many forms of steel





The illustrations appearing on these two pages were obtained through the courtesy of several manufacturers of automatic motor driven oil burning equipment and will serve to show different types of burners, how the electric motors are attached and some of the wiring and other electrical apparatus used with oil burners

Obsolescence and Modernization

The Author

When an industry finds itself suffering from obsolescence it is another way of saying that it is suffering because its competitors are more progressive

By WALTER H. RASTALL

Chief of Industrial Machinery Division
United States Department of Commerce

EVEN under the boom conditions of 1929, a surprisingly large number of American industries were struggling with the problem of "profitless prosperity" and excess factory capacity with competition that at least seemed excessive if not unintelligent and that long category of related problems that can perhaps best be described as those that receive the attention of the typical trade association.

Careful consideration of these subjects raises further questions as to the extent to which these evils resulted from excess factory capacity, and this, in turn, raises a further question as to the extent to which this excess capacity represents equipment that is out of date; in other words, the possibility that these business evils result from retaining too long in operation obsolete and decrepit machinery. Sometimes the subject is further complicated because of the influence of style. Factories producing radio apparatus, appliances and other electrical equipment, for example, are frequently called upon to produce a style or model suitable for a given season but which will not be called for again.

UNLESS carefully watched, obsolescence of plant or equipment can become a sort of pernicious anemia for an industry. It can eat away the financial structure of that industry. The greater the progress of an industry the greater is the threat of obsolescence and to think of the "terrible cost of obsolescence" is another way of thinking of the "terrible cost of progress"

In such industries it is exceedingly easy to accumulate much machinery for which there is little active demand. Instances have come to the writer's attention where machinery that would not wear out for twenty years has been rendered hopelessly obsolete in ninety days. Furthermore, there is reason to believe that this is a situation which all too frequently is not properly reflected in accounting practices. Obsolescence is too often tied up in the accounts with depreciation and a nominal sum set up to cover the two, which at best represents a guess as to the amounts involved and the rate all too hastily arrived at.

Where this type of accounting is carried too far it is entirely possible to liquidate the assets of the enterprise unconsciously. The stockholders undoubtedly feel they have a well equipped plant but awake some day suddenly to discover it is worthless and instead of finding an adequate reserve on the books to meet the situation, they find that these funds have been distributed as dividends or else have melted away in the form of an invisible cost.

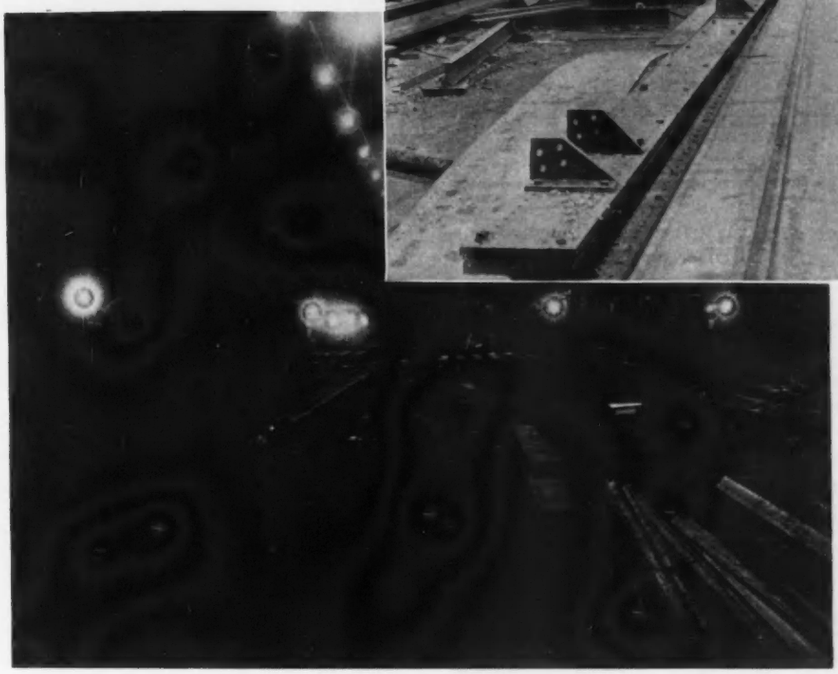
The United States Department of Commerce has been endeavoring to study this general situation and it is obvious that any comprehensive study would be a most involved undertaking. Instead, the situation is being approached gradually through investigations covering particular cases. In one instance an inventory was made covering more than 1100 machines in 32 factories. The full report is not yet available for distribution, but indications are that it will become so in the late spring. Of course, the usual quaint incidents developed.

For example, the oldest units found had been operating in the present plant for 50 years and were second-hand when purchased. It seems scarcely probable that such machines can be commercially successful. There has been too much progress in the interval.

Preliminary reports have been submitted and have commanded enthusiastic interest with the results that a request has been made for a further similar survey in other districts and it might be wise to suspend judgment until one can ascertain whether the findings of the first experimental study will be confirmed in still other surveys. On the other hand, the first investigation appears to demonstrate quite clearly that there is a surprising amount of obsolescence in the machinery of this industry and the manufacturers concerned will do well to reconsider the subject from the beginning and in all of its aspects in order that they may be satisfied that each unit is properly adjusted to the particular manufacturing operation involved.

A cursory examination of the returns suggests strongly that there is opportunity for great improvement in this

IN a recent survey conducted under the direction of the Industrial Machinery Division of the Department of Commerce in thirty-two factories, where 1100 machines were inventoried, the oldest units had been operating in these plants for fifty years and were second-hand at the time they were placed in service



THERE is a general trend in the more progressive industries today looking toward modernization of plant and equipment. Old and obsolete machines are being discarded. Individual motor drives are coming into more common use. One striking example of "before" and "after" in modern lighting is shown above

respect. These manufacturers will also probably find it desirable to reconsider from the beginning also their accounting methods. With the data developed they will have material for what might be called an actuarial study of the experience of their trade for several years and consequently will be in a better position to check their accounting methods and eliminate losses that heretofore have been invisible. A similar cursory examination of the returns suggests that this will be very important.

As sort of a by-product from the investigation it appears that there are too many types of machines and perhaps an opportunity exists for a simplification or a reduction of excess variety which should help not only one class of manufacturers and also the manufacturer of machinery and electrical equipment. This should tend to reduce machine costs and eliminate a certain amount of other confusion that has resulted from the existing situation.

All of this is preliminary, of course, even tentative. In fact, this first investigation may be looked upon as sort of an experiment but one not of interest merely to the industry concerned but one which establishes principles that will perhaps prove significant and important to most other branches of industry. The subjects involved are somewhat complicated although they bear a very vital relation to general prosperity and public welfare. Experience to date suggests the great desirability of careful study of the results of the present investigation and further work along the same general lines in perhaps a good many other industries.

INDUSTRIAL accounting methods and allowances for depreciation have much to do with the obsolescence of plant and equipment in many industries, and a comprehensive study of existing practices indicates that there is opportunity for improvement

Unless carefully watched, obsolescence of equipment can become a sort of pernicious anemia for an industry, or changing the figure of speech, it can eat away the strength of the financial structure of an industry just as white ants eat away invisibly a structure of wood, and just as it is difficult to discover from external appearances the exact condition of a wooden structure properly, the time has come when American business should examine carefully regarding the possibility of serious destruction from "business termites," and as termites in wood are revealed by little evidences of sawdust that has fallen before their mandibles, we should suspect "business termites" when an industry is afflicted with excessive factory capacity, unintelligent competition and "profitless prosperity."

It would appear then that we are confronted with the problem of including in our accounting methods allowances for the progressiveness of competitors.

"Megger" Instruments

The value of the "Megger" instrument in electrical testing lies largely in the speed with which insulation resistance can be determined

By T. B. Whitson
James G. Biddle Company

THE "Megger" instrument is a portable device for making quick tests of electrical insulation and other high resistance. It consists essentially of a direct-reading ohmmeter of the permanent magnet moving coil type mounted in the same case with a direct-current hand generator which supplies potential for the test, usually at 500 or 1000 volts. There are various scale ranges up to 10,000 megohms, but those which cover most practical requirements and therefore are in most common use read from 0 to 100 megohms in what are called low-range instruments; and from 40,000 ohms to 1000, 2000 or 5000 megohms in high-range instruments.

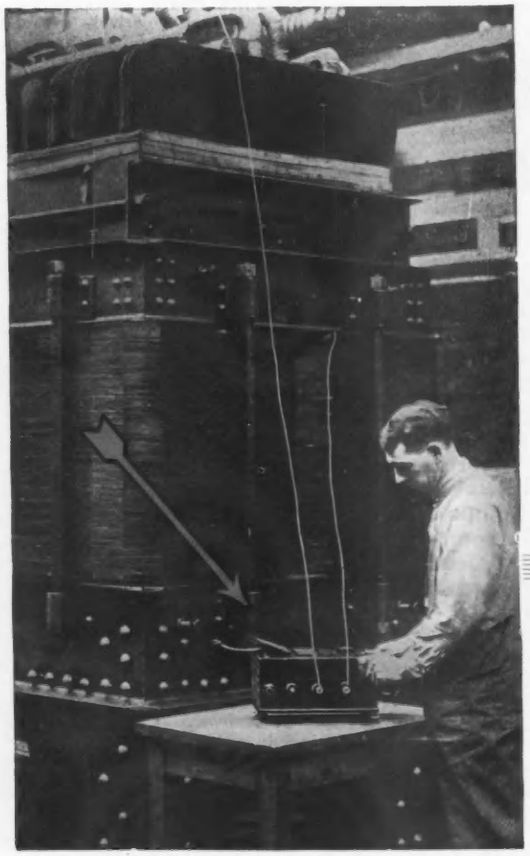
An understanding of the principle of operation of the "Megger" instrument is not at all necessary for its proper use, but is given in the latter part of this article for those interested. To use the instrument—for testing the insulation resistance of a motor, for example—one simply makes connections from one binding post of the instrument to the copper winding or conductor of the motor, and from the other binding post to the iron frame or "ground" of the machine, turns the crank and reads the result directly from the scale. The motor, of course, must be disconnected from the line.

The value in use of the "Megger" instrument arises largely from the simplicity and speed with which insulation resistance tests can be made with it. It has its own source of current and requires no particular "brains" or effort to obtain the correct result. In consequence of this fact, practical insulation resistance testing, or "Megger testing" as it is so commonly called, has found a very important place in the manufacture, installation and maintenance of nearly all types of electrical equipment.

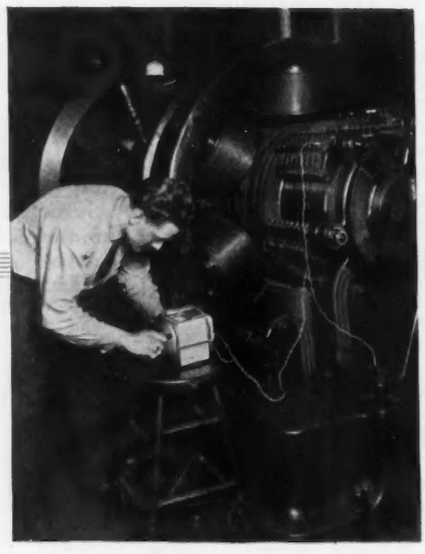
Let us consider first just what the insulation resistance test is, and why a knowledge of it is so valuable, after which a number of practical applications of "Megger" instruments will be referred to.

Obviously any electrical conductor, machine or appliance depends on good insulation for its proper functioning. All insulating materials have two fundamental electrical characteristics:

1—Resistance to the passage of current either through the material or over the surface of it—Insulation Resistance.

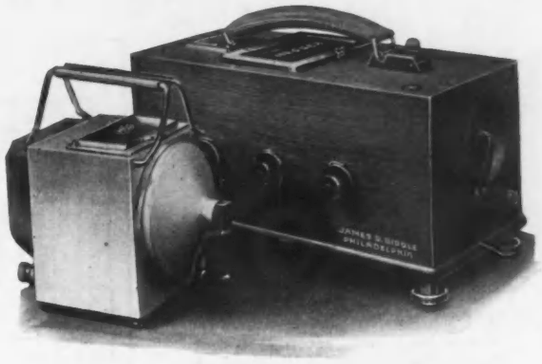


High-Range "Megger" Testing of Transformers



A "Megger" Test on a D.C. Generator

in Electrical Testing



Two Typical "Megger" Instruments

2—Strength against breakdown under static or high voltage stress—Dielectric Strength—(*puncture voltage*—as it is sometimes called).

Doubtless every one is familiar with the high-voltage—or "hi-pot"—test of dielectric strength. It is specified by the American Institute of Electrical Engineers, and is part of the National Electric Code, Underwriters' Standards, etc. It is generally accepted as a necessary test on new and also rebuilt electrical apparatus.

Insulation resistance is almost equally important, but is more difficult to control and to predetermine. For example, it varies from day to day with humidity, temperature, etc. While insulation resistance is not a correct indicator of dielectric strength, it is frequently a valuable safeguard in warning against the application of a dielectric test before the apparatus is ready for it. Low insulation usually is a very definite indication of the presence of moisture or poor insulating materials or both. A test of dielectric strength, on the other hand, is no indication whatever of the value of insulation resistance.

Insulation resistance is expressed in ohms or megohms (millions of ohms) and is proportional to the thickness of an absolutely uniform insulating material and inversely proportional to the area under test. For example, a short piece of cable may show a very high "Megger" reading, say 5000 megohms or more, while two or three thousand feet of the same cable would show a much lower value (100 or 200 megohms) owing to the increased number of current paths through the insulating material which has greater total leakage with the longer length of the cable.

It is important to note that the insulation resistance test is made—with the "Megger" instrument—without undue risk of injury to the apparatus under test.

"MEGGER" instruments have become important tools in the inspection of insulation resistance in practically every type of electrical apparatus. They are used extensively by manufacturers, telephone and telegraph companies and for many inspections of wiring such as those for light, power, signal and alarm systems. They are also very important tools in the maintenance of electrical apparatus in manufacturing plants

Dielectric strength is usually expressed in terms of the voltage at which insulation punctures or fails at some particular point due to static stress. It can be measured only by testing to failure—similar in principle to the way samples of building material are tested to destruction.

It still seems necessary to apply the high-voltage test to new or repaired electrical equipment, but engineers are becoming more and more agreed that it is "playing with fire" to apply a high-voltage test to apparatus which is in service and functioning properly. It seems much more to the point to make a test of insulation resistance to detect the presence of dirt, moisture, corrosion and deterioration, and thereby keep equipment in such good condition that troubles cannot develop to a serious stage. A good analogy is elevator cable. We do not subject an elevator cable to a breakdown test in order to determine whether it has weakened with use—we examine it for worn or broken strands, and measure it for stretch, without subjecting it to an unnecessary risk of failure.

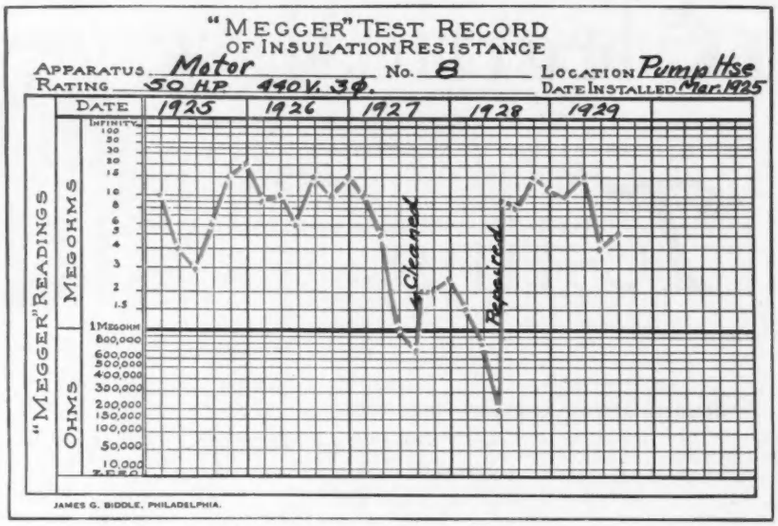
This—in principle—is essentially why "Megger" instruments are used quite generally in modern electrical maintenance work, especially on generators, rotary converters

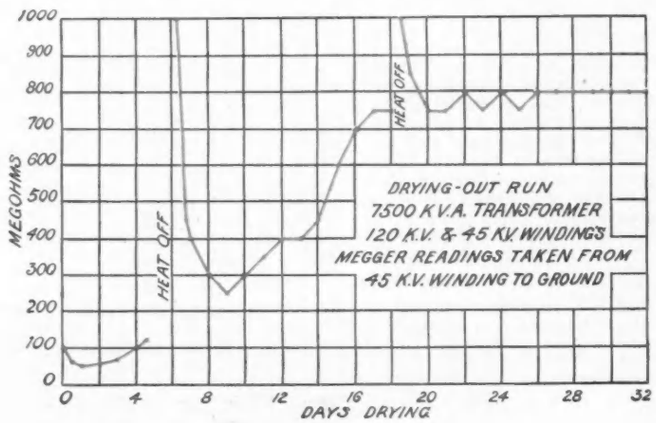
Testing a Motor Stator Winding

Measuring Radio Grid-Leaks

GRAPHIC records of "Megger" readings of apparatus in service are highly valuable in plant maintenance work. A sudden drop in the insulation resistance of any device is usually of greater significance than the exact value at any given time

TRANSFORMER manufacturers keep such records as that shown below. It is termed a "drying-out" curve and complete dryness is indicated by the insulation resistance becoming constant. Notice how the insulation resistance increased when the heat was turned off





and important motors, feeders, lines, etc. They give that "ounce of protection," particularly when a record is kept as shown in the accompanying illustration entitled "Megger" Test Record.

Largely for the reasons just given, the "Megger" instrument has become an exceedingly valuable tool among insurance companies for acceptance and for periodic inspection of electrical equipment which they insure. Plants which do not carry electrical insurance can, of course, avail themselves of the protection which the "Megger" test affords.

Other important maintenance applications for "Megger" instruments include testing the insulation resistance of wiring installations of all sorts, such as light, power, signal, and alarm systems; meter and supervisory control circuits; railway locomotive, car lighting and trolley car wiring; wiring of gas-electric railway cars and buses; railway signal and automatic train control circuits; airplane and airport wiring, etc.

For making insulation resistance tests of electrical equipment during manufacture and at time of installation, the "Megger" instrument is used extensively for testing transformers, large armature windings, etc., while drying out, since the test is a very definite indication of dryness. Nearly all transformer builders and manufacturers of large motors, generators and rotary converters, use "Megger" instruments for this purpose.

Another valuable use for "Megger" instruments during manufacture is in testing equipment before applying the high-voltage test. If considerable moisture is present or if the insulation resistance is low from any other cause, it may be very unwise to apply the high-voltage until the machine or equipment is dried out or otherwise properly prepared for it. Furthermore, an insulation resistance test after the high-voltage test is frequently a very definite indication of whether or not the application of the high-voltage has weakened the insulation without actually breaking it down. This is indicated by a lower "Megger" reading after the high-voltage test than before.

In cable manufacture, it is frequently necessary to test insulation resistance to values quite beyond the range of the "Megger" instruments and hence a laboratory method is employed using a highly sensitive reflecting galvanometer, battery, resistances, etc. However, most cable companies have "Megger" instruments for quick tests and for inspection work.

Another very convenient application of the "Megger" instrument is in testing switchboard and panelboard slabs before and after drilling. By using two insulated test terminals—such as metal plates—metallic veins are shown by very low resistance, usually quite variable from point to point. Moisture will give higher readings, though not as high as a uniformly dry slate or marble slab.

Certain ranges of the "Megger" instruments are peculiarly adapted for testing grid-leaks and resistors used in radio, and a large number of companies use this method for such work. It is direct-reading, quick, and quite as accurate as it is usually possible to make or to adjust resistors for radio use.

The testing of condensers used in radio receiving sets has also called on the "Megger" instrument for a very important service. In this work, as well as in testing

(*Continued on page* 74)

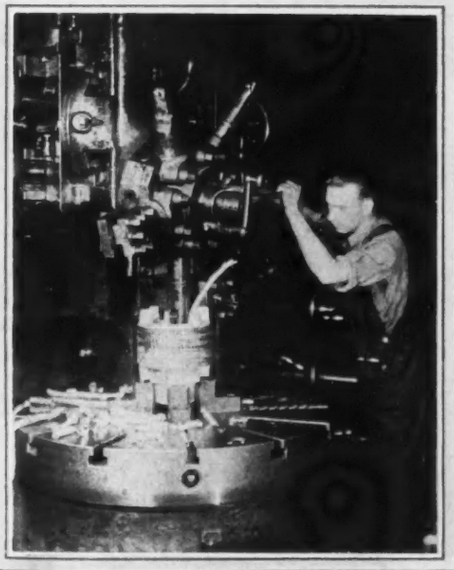
A Motor-Driven High-Range "Megger"

Building and *Testing Electric Motors*

Twenty-one years ago there came into existence in Los Angeles, California, what is today one of the largest motor manufacturing organizations in the western United States. It is the U. S. Electrical Manufacturing Company, whose products are solely electric motors, ranging in size from those of fractional horsepower upwards. In its factories in Los Angeles these are produced with the most modern manufacturing equipment and under the most exacting specifications and rigid performance tests to insure uniformity and quality

In the production of stator discs in the U. S. factory the whole steel sheets are sheared into square blanks, which are then taken to the blanking and notching presses in order. The illustration at the left shows a Ferracute notching press as it is used for blanking slots in the field laminae of large units

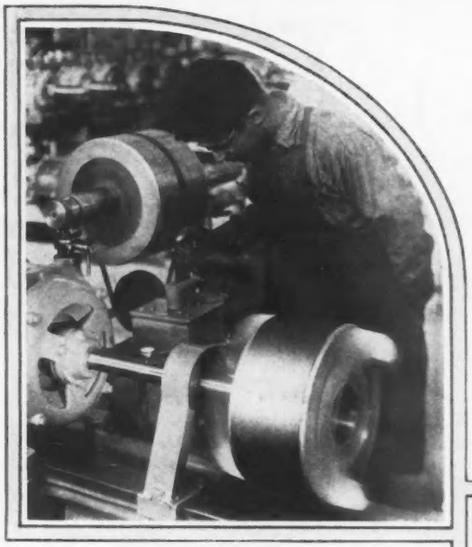
As an example of the quality built into U. S. motors the internal bore of the stator laminations is accurately machine-ground to establish perfect air gap dimension between the stator and the rotor. The manner of performing this operation and some of the equipment employed is shown above



U. S. squirrel cage motors have one-piece die-cast rotors and the only machining operations required are those of cutting away the risers on the casting and finishing the outside of the laminations

The view at the left shows a vertical boring mill as it is employed in the U. S. factory for removing the risers from die-cast rotors preliminary to machining the outside of the steel laminations

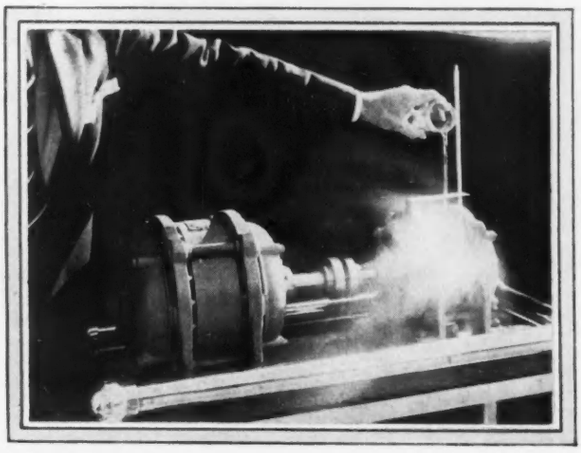
For the rapid production of drilled parts in the U. S. plant high-speed multiple-spindle machines are used. And as all castings are annealed, it is possible to make use of high-speed drills for economy and speed



Another example of the manner in which dynamic balancing is used in the U. S. plant is shown at the left. This is a balancing machine fitted with indicating instruments. The operator at the left is inspecting finished field stator windings

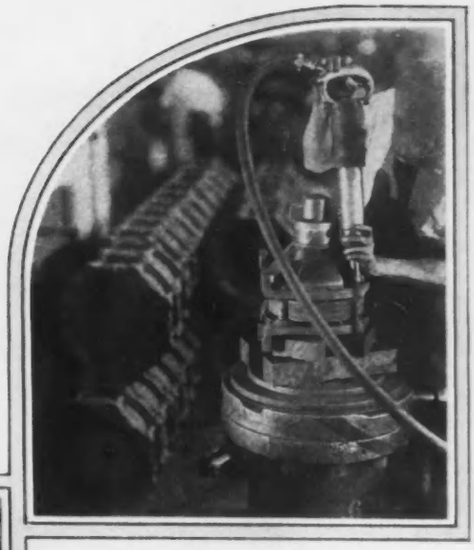
Quality products and straight line mass production dominate the manufacturing operations in the U. S. motor plant, as may be seen in the view at the right, which is typical of the arrangement of the plant showing the assembling of motor parts

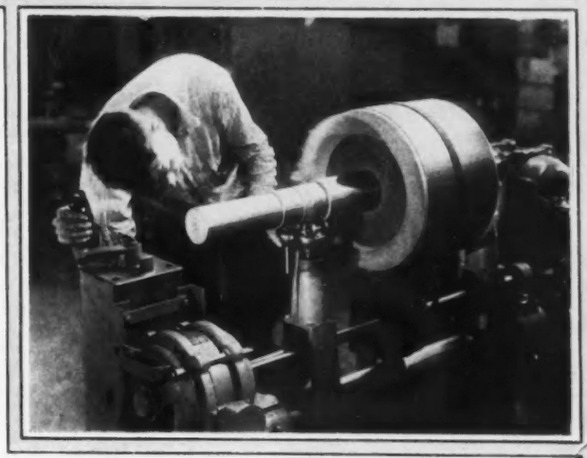
Popular demonstration of the heat resisting quality of the asbestos protected windings employed in U. S. motors is shown in the view below. An interesting example of work of this kind is illustrated in a series of life tests recently completed for the purpose of determining the quality of asbestos insulation in motor windings. During this test period of many months some 93 motors were placed under extreme loads. Overloads were increased steadily, day after day, until the motors finally failed and from these most exacting experiments accurate data were obtained relative to the performance of these motors



Every modern facility is employed to the fullest extent in the factory of the U. S. Electrical Manufacturing Company. The entire industry is housed in the latest in building construction, manufacturing facilities are of the most recent design and the arrangement of these facilities conforms with the best conception of manufacturing methods. One example of the use of modern equipment is shown in the view above illustrating the application of spray painting

Uniform quality in electrical steel is essential in the design of a well made motor and to insure this uniformity of quality all electrical steel employed in the construction of U. S. motors is tested by the Epstein method which establishes the losses at given densities





Stator core punchings in U. S. motors are made from silicon electrical steel and in the assembling of the laminations they are compressed under heavy hydraulic pressure while the rivets are set and headed, much in the manner shown above

To insure the best in materials, workmanship and performance in its products the U. S. Electrical Manufacturing Company maintains a most completely equipped experimental and testing laboratory in which research engineers and chemists are constantly employed. Part of the work of this department includes the study of bearings, chemical tests and observations of insulation compositions, the development of windings, the limits of fatigue and the hardness of metal used, with life tests of new motor construction and the technical testing of changes in standard products

Dynamic balancing as well as Stroboscope or Vibroscope tests play an important part in the rigid performance requirements of U. S. motors and for this reason these methods are employed extensively. The view in the center of the page shows the dynamic testing equipment while that at the left illustrates the Stroboscope test method. The view directly above shows how keyways are machined in shafts, four cuts being taken at once with eight shafts in the machine

Experience

has dictated many methods to assure

DEPENDABLE UNIFORMITY

UNIFORMITY of "Nichrome" IV starts with Driver-Harris laboratory control of its own electric melting furnace, continues through the Driver-Harris rolling mill and through every step of production.

UNIFIED CONTROL, as we term it, is made possible only through Driver-Harris ownership of these production factors.

Here is shown a corner of the Driver-Harris test room, where life tests are made which govern this control.

Driver-Harris experience gives it the KNOW in making "Nichrome" IV—the Test Room gives it the KNOW about "Nichrome" IV, made solely by Driver-Harris Company, Harrison, New Jersey.

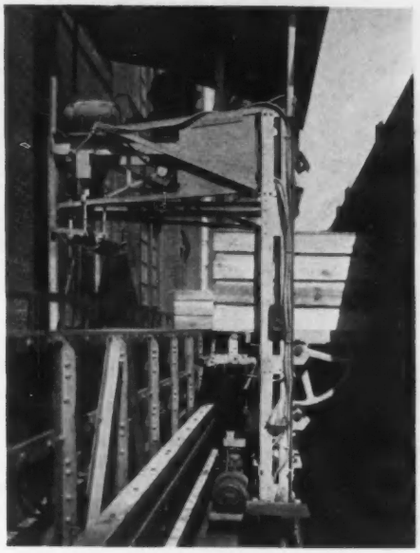
MORRISTOWN PLANT

Nichrome IV

HARRISON PLANT

Safety Is Highly Important in Materials Handling

SAFETY was the dominating factor in the selection of the materials handling equipment installed in the Schenectady plant of the General Electric Company for the conveying of refrigerator cabinets



IN planning the different conveyor installations precautions were taken to insure proper control over the different sections and guards were placed over all exposed moving or driving parts to insure safe operation

By R. H. HUCKE*
General Electric Company

UP to a few years ago very little attention was paid to materials handling problems. However, since the war, which killed a large number of men who would naturally have become laborers, and also, restricted immigration, materials handling has been getting more and more attention from industrial leaders through the advent of mass production in manufacturing.

In the last few years a good deal of activity has been centered around the manufacture of refrigerators which, because of the large production and size and weight of the product, presented an excellent opportunity for mechanical handling. The magnitude of this job can be better visualized by giving a few statistics on the quantity of raw material required to keep the production up to the required schedules in the General Electric Schenectady plant.

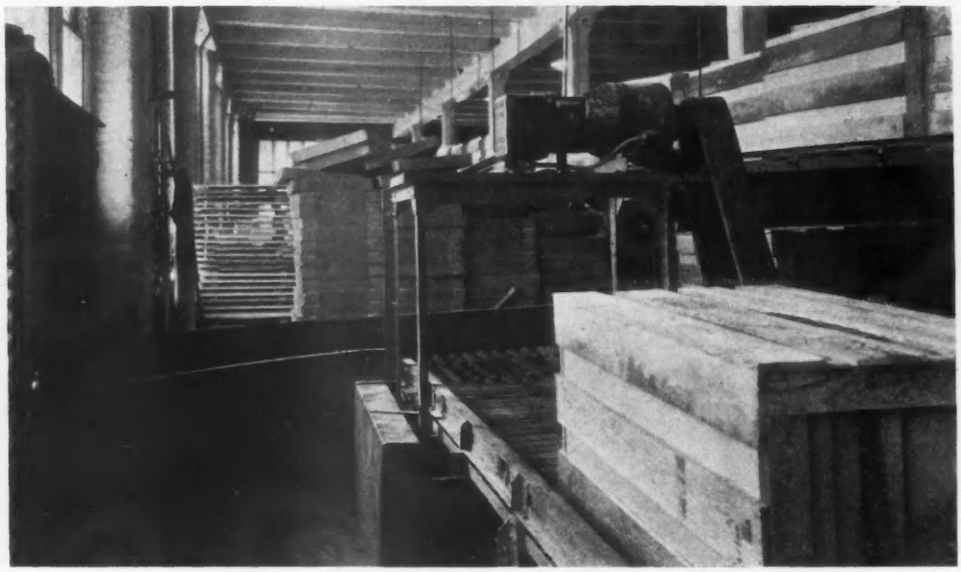
Approximately nine carloads of insulating materials are handled from the cars to storage, or to the assembly lines, per week. To handle this amount of material, which is only a small part of what goes to make up the refrigerator box, would require a crew of fifteen to twenty men and a fleet of trucks. With a conveyor system, four to six men handle all of the material, with no congestion. The manufacture of the refrigerator box required a large tonnage of steel which was fabricated into shape, after which it was prepared for painting and enameling. As soon as it was finished, ready for painting, it was suspended from an overhead chain, which carried it through the several finishing operations, through the ovens, and directly to the assembly floor. This chain conveyor is approximately 5000 feet in length, and has permitted a reduction in the amount of material in process to a point where the manufacturing and assembling could be carried on in a floor space considered entirely inadequate by any other means of handling the parts.

The assembly was then organized in a continuous straight line on a moving slat conveyor to a point where it was ready for shipping. At this point another conveyor handles the packing cases from the carpenter shop to the assembly line, where the units are completed and ready for shipment. At this point the boxes are dropped into the packing cases and conveyed to the shipping paltform by means of a conveyor, which is described later. Bearing in mind that these units vary in weight from four hundred to eleven hundred pounds each, this conveyor has many novel features.

When refrigerator manufacturing was first begun with an all-steel cabinet, safety was an important factor. In the design, the cabinet featured the art of preserving food safely with good appearance. With the production of these cabinets at the Schenectady Works, the safety thought continued. Safety to the employees and, also, in the handling of the cabinets, as in the beginning of their manufacture, still prevails today.

During the beginning of the refrigerator cabinet production, conveyors and other mechanical handling equipment played a small part in the picture as compared with their application to the present layout. There are several reasons for these changes from simple to elaborate handing systems. In the beginning, the output of the cabinets was small, and this did not warrant the expenditure of large sums of money for handling equipment. As the production increased, and with the addition of three cabinets of larger size, it became necessary to improve the handling facilities of the department. This was done without limiting any expense in making the new conveyor systems as

*Abstracted from a paper presented before the American Society of Mechanical Engineers, March 7, 1930, at Chicago.



AT the left is a transfer point at the end of the one-door cabinet assembly line to one of the roller gravity sections of the conveyor system, while the illustration below shows the loading platform with one of the unloading devices

efficient and safe as was consistently possible.

A description of the new shipping conveyor system for handling the refrigerator cabinets is interesting because of its safety features. The question that may be asked is what are the duties of this new conveyor system, and how are they accomplished? The duties are to convey the cabinets from two similar cabinet assembly lines on the second floor of the building to the shipping platform, and then to the freight car. The one line conveys large and small cabinets.

These cabinet assembly lines on the second floor are in parrallel approximately 40 feet apart, and run longitudinally with relation to the building. One is used for the assembly of the one-door cabinets; the other for the two-door cabinets. The shipping platform is located along the east side of the building and is long enough to accommodate six freight cars.

THE operation of the new shipping conveyor system begins with receiving the two-door cabinets in their shipping crates, with backs down and feet at right angles to direction of travel. They are conveyed from their assembly line in this position by means of a power-driven conveyor of the inclined apron type to a section of roller gravity conveyor. These cabinets, while still on the roller gravity conveyor, make a 90-deg. turn and then head across the second floor to an opening in the wall of the building. This section of roller gravity conveyor is now at right angles with relation to the one-door cabinet assembly line.

The one-door cabinets are received from their assembly line in shipping crates, with backs down and feet pointing in the direction of travel. In this position they are conveyed to the same section of roller gravity conveyor as the two-door cabinets, by means of an apron-type conveyor. An interesting feature of this part of the system is the simple automatic arrangement for the transfer from the apron-type to the roller-type conveyor at right angles, and at the same time changing the direction of travel of the one-door cabinets from a longitudinal to a transverse position on the section of roller gravity conveyor. This is accomplished by a series of power rollers, set in such a manner as to control accurately the direction of the one-door cabinet until released to the roller gravity conveyor. The one-door and two-door cabinets are now on the same conveyor, with their feet at right angles to direction of travel.

All cabinets, after passing through the wall opening on the roller gravity conveyor, ride a 90-deg. gravity roller curve which delivers them to an inclined power slat conveyor. This conveyor is in line with the shipping platform. The cabinets are carried down the incline on the slat conveyor to a power roller flight conveyor, which extends the full length of the shipping platform. This type of conveyor was employed to furnish ample storage of cabinets while the freight cars are being shifted. This is essential as production must not be interrupted while the loaded cars are being removed from the siding and replaced by empties.

The frame structure of the power roller chain conveyor is so constructed as to carry rails on which two power-propelled semi-automatic tilting devices, called unloaders, run. The purpose of the unloader is to remove the cabinets from the power roller chain conveyor and deliver them to

REFRIGERATOR cabinets, boxed and ready for shipment are passing down this apron type conveyor on their way to the shipping platform shown below. The unloader on the platform is shown more in detail on the first page of this article

the freight-car floor in an upright position, with feet down. Each unloader is equipped with an individual motor drive which propels it along the power roller chain conveyor through a rack and pinion. This drive is controlled manually so as to permit the operator to move the unloader to the freight-car door—no matter where the car may be stationed along the siding.

The unloader consists of two distinct operating parts, the transfer arm, or kick-off, and the tilting mechanism. These two operating parts are equipped with separate motors and worm gear reduction units.

As each size cabinet is of a different width, and all cabinets must be diverted from the power roller chain conveyor approximately at the center of the unloader, a special electric switch was designed and called the selector.

With this new conveyor system, a carload—consisting of 51 single-door cabinets, weighing approximately 400 lb. each—were delivered to the freight car in 35 minutes. The only help required was two men in the freight car. This is about half the time and half the number of men formerly required to handle the same number of cabinets. The two-door cabinets, weighing 800 lb. and 1100 lb. respectively, are handled with ease by the new conveyor system. Formerly these cabinets were placed on a truck and lowered to the first floor by a platform elevator, and then trucked to the freight car. This method was a laborious one and required the services of an additional crew of men.

In commenting upon this new conveyor system, it may be said that it has helped to increase and hasten the shipping facilities of the department. The crated cabinets are handled from their assembly lines to the freight cars with the utmost safety. Safety, also, has been realized by reducing the human element involved in operating the system to a minimum. This was accomplished in large measure by applying the electric equipment that controls the movement of this conveyor system. Another feature that should be mentioned is the fact that all the conveyors in the system are properly guarded to insure safety to the employees.

THIS conveyor system is one of many in the Schenectady Works that are doing their work efficiently and safely through the help of electricity.

In concluding, it may be stated that the following procedure is in practice at the Schenectady Works in the selection and use of material handling equipment; to help insure safety, all layouts involving the use of conveyors are submitted to the works safety engineer for consideration. A thorough check, from safety standpoint, is thus given each layout. No conveyor is permitted to be installed until the works safety engineer is satisfied that it will be safe. After the conveyors are installed, another inspection is given them to further the cause of safety before they are put into final operation. No expense is spared in the use of guards and safety switches.

Only designated employees are permitted to operate the conveyors, and they are instructed at all times to play safe in their work. Accidents result in a loss of time and money to both the injured employee and the company, because the amount of compensation received cannot equal the worker's regular earnings, and the cost of compensation represents an expense that must be added to the business.

Electrical Materials Widely Used—

Varnished Cambric

INSULATING materials used in the construction of modern types of electrical equipment must be made of the best in materials to withstand the strains of high-speed operation. For this reason many changes have been made in the older methods of making insulation

By W. M. BRAZELTON
Westinghouse Electric & Mfg. Co.

THE methods of manufacture of varnished cambric have passed through several stages of development. The first attempts at applying a layer of varnish to cloth were made by brushing. The results obtained through these efforts left much to be desired, but the prospects were found to be very promising, hence the study was considered worthy and work continued. Later investigators found that a superior coating could be attained by dipping sheets of the fabric in the varnish and allowing these to dry. Since that time varnished fabrics were assured of a prominent place in electrical design.

It was but a short time subsequent to the dipping experiments that a continuous process was considered and treating towers were developed. The general scheme of construction and operation of these treating towers has changed very slightly since the first machines were built.

These treating towers are simply large ovens, usually of the vertical type, having several rolls or guides for conducting the fabric in continuous lengths through a series of passes through the oven. At the bottom of each pass the guide roll is immersed in the varnish which is to be applied and the fabric in passing around this roll is drawn through the varnish.

The first pass through the treating varnish results in simply impregnating the fabric. In this part of the operation there is very little, if any, increase in thickness of the fabric. After the material leaves this impregnating bath it passes through the heated chamber or oven where the solvent is driven off and the oxidizable oils are dried to the proper surface condition. Further oxidizing is accomplished when the material reverses direction of travel at the top of the tower and again passes through the heated chamber in returning to the varnish tanks at the bottom of the tower. In the subsequent cycles the varnish is building up the surface films so that the required thickness of finished product is attained.

Thickness of the finished material is governed by the thickness of the fabric, physical characteristics of the varnish, amount of non-volatile matter available in the varnish and speed of the fabric in passing through the treating tower. The type of surface or finish, of the varnish film, is also governed to a large extent by these several factors.

Fabric best suited to the making of varnished cambric of the quality required by the builders of electrical apparatus, is a fine material woven from high grade yarns. It is closely woven and great care is exercised in maintaining a product of consistent quality and finish.

There are certain applications in which there is very little call for elasticity as regards the longitudinal stretching. In these cases the base fabric is used. This material may be called straight woven cambric.

When the fabric is expected to have elongation and recovery characteristics the cloth is so woven that it can be slit in such a manner that the warp and filler threads assume a definite angle with regard to the length of the sheet. This fabric is called seamless or continuous bias cambric. The general characteristics of this type of fabric are identical with the straight woven material.

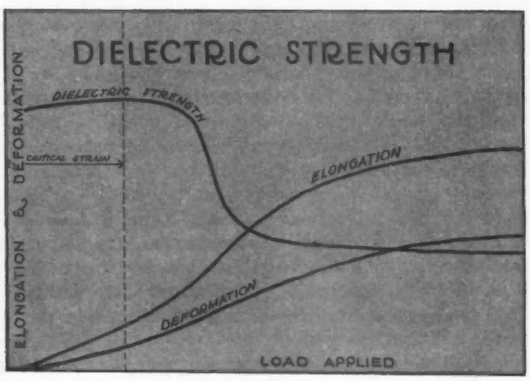


Figure 1

A diagrammatic presentation of the results of tests of insulating tapes made from varnished cambric showing a material of high dielectric strength when it is not stretched beyond a critical point

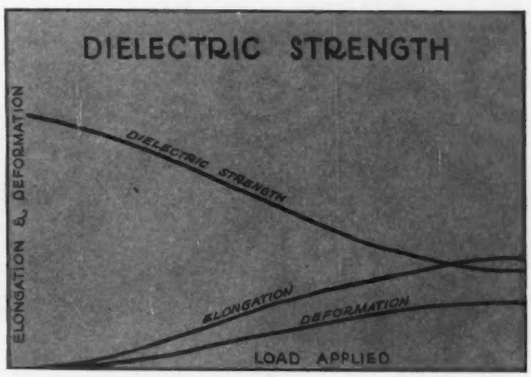


Figure 2

These curves represent the results of tests of insulating tape to which a varnish having a high degree of elasticity has been applied. Under stretching loads the dielectric strength drops

In order to produce a varnished cambric of the bias type the straight woven cambric is cut on a given bias. The selvage edges are then sewed or pasted together and a material is produced which is a bias cut cambric. However, this type of fabric is inferior in several points to the continuous bias. The most noticeable of these points is the splices which occur at regular intervals causing irregularities in the thickness and strength in the finished material at these splices. Owing to these variations in physical characteristics this type of material has dropped to a position of lesser popularity with the introduction of continuous bias cambric.

VARNISHES used are of the baking type. They must be highly elastic and pliable and at the same time sufficiently hard to withstand abrasion and rough handling during application of the treated fabric to the machine in which it is to be an insulator. Other demands made on the varnishes are water and oil resistance, adhesive qualities, acid resistance, non-corrosive characteristics, etc.

Tan or yellow insulating varnish is similar to all other drying oil varnishes in that it consists of cooked vegetable oils and driers. These oils are kettled at high temperatures for varying lengths of time in order to cause them to take on the desired properties as indicated previously. In some processes the solvents are of a high boiling type such as kerosene or solvent naphtha. These solvents generally slow up the process of treating but have the desirable advantage of causing the varnish film to flow smoothly. Benzine is considered by some manufacturers to be a more desirable solvent since it is much lower in its boiling range and consequently is not so apt to be left in the varnish film after it has formed its horny surface by oxidation. There is, however, some trouble experienced in getting the varnish to flow out smoothly before the solvent has left it. This trouble is overcome by allowing greater time for the fabric to air dry before baking.

The black type of varnished cambric is made in the same manner as the tan except that black asphaltum gums are substituted for a large part of the drying oils as used in the clear varnish. These gums and oils are processed similarly to the oils in the clear varnish and the application methods in varnish are identical with those in applying the clear varnish.

When the fabric has passed through the various cycles of its process it is wound on a mandrel. From this mandrel it is rewound and slit to such widths as are desired for the specific application.

Large quantities of varnished fabrics are used in the sheet form. This material is nearly always of the straight woven type. In this form it is generally applied to straight lengths of conductors and then bound with a layer of bias woven or other type of treated or untreated tape.

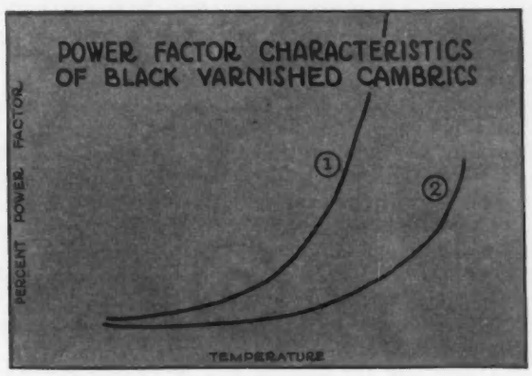


Figure 3

A diagrammatic presentation of the power factor characteristics of two different kinds of insulating tape made from varnished cambric. The only difference in the two tapes is the kind of impregnating varnish employed

There are a few cases when the straight woven fabric is slit into tape form and used as such. The most important of these, considering volume of treated materials used, is the cable industry. In such cases, when straight woven material is used, the fabric is applied spirally and the butted joints between turns which result from this method of application are covered by the successive layers.

For general taping applications, the continuous bias material is most popular. This fabric is slit to a width which is applicable and rolled into small diameter rolls which are of a convenient hand size. The tape is then applied to the apparatus in a spiral manner and the joints as found in the straight woven tape are eliminated by overlapping each suceeding turn.

The characteristics of varnished cambrics which may be said to be of major importance are finish, tensile strength, elasticity, dielectric strength, moisture resistance, oil resistance and power loss. Studies of these characteristics have been carried on for many years and improvements have resulted that have made vast changes in the ratings of electrical apparatus.

THE first characteristic that is important is that of finish. There is no reliable method of test for this characteristic. It is merely a matter of appearance and is a subject for visual examination and the inspectors' opinions. There are two common causes of poor finish which are rough cambric and poor varnish. Rough cambric is a result of improper calendering or an incorrect amount or kind of sizing. It is essential that the sizing material be such that it is not affected by the varnish solvents since this would cause it to lose its power to hold the nap or fiber ends of the fabric down smoothly. The sizing is only able to hold the nap in place; the calendering operation can place the nap but cannot hold it there. It is therefore necessary to balance these two treatments to assist in producing a smooth and glossy varnish film. When the nap is not held down properly these little hair-like tips of fiber tend to protrude through the varnish film and by capilary action draw a little cone of varnish up around them. The varnish cannot completely cover these tips and a moisture-absorbing path and point of low dielectric strength results. A similar defect is the result of what is called seedy varnish. This is varnish in which small, solid particles are held in suspension in the solution. These particles might be pieces of dirt or other foreign matter or small pieces of gums or oils which have been rendered insoluble by the heating of the varnish constituents in the process of its manufacture.

The cure for these troubles can only be infinite pains in inspection of the fabrics and varnishes. The fabricators of these materials can produce suitable products and in the past few years very important changes have been made by them that have resulted in highly satisfying reductions of these faults.

The tensile strength of varnished cambrics is simply a physical characteristic which is but slightly effected by the type of varnish used. The tensile strength of straight woven fabrics is usually given for both directions of the weave. These values are best obtained in a fabric testing machine of the inclination balance type.

Elasticity of a tape usually is the second point an inspector observes. This characteristic is usually given consideration in bias woven fabrics only. This is of considerable importance and exact evalution can be determined by the same method and apparatus employed in the tensile strength tests. It is also advisable to test with the apparatus and methods as set out in the A.S.T.M. Tentative Methods of Testing Dielectric Strength, Serial Designation D 149-27 T. The results when developed as a set of curves are interesting. Comparative tests are illustrated in Figs. 1 and 2. These curves were developed from test

results collected in a competitive test by a user of quantities of tape in underground cable maintenance.

Fig. 1 indicates a material of high dielectric strength when not stretched beyond the critical point. However, when it passes this point an abrupt change is evidenced which indicates a severe rupturing of the insulating medium or varnish film. This failure brings the dielectric strength down directly to the minimum which is practically the value of the air gap equivalent to the thickness of the fabric. There is also a sharp divergence of the curves of the percent elongation and deformation showing a lack of elasticity which is characteristic of a hard or brittle material. After this critical load point has been passed there is very little change in the characteristics upon increasing loads. These values show that the material is of a high degree of hardness, but not sufficiently elastic or plastic to maintain a satisfactory insulation value under the severe conditions of application of the tape to sharp bends or irregularities in the conductor.

With the curves in Fig. 2 it is seen that a varnish of a high degree of plasticity has been applied to the fabric. Upon applying stretching loads in the same manner as in the previous test the inspector finds that the dielectric strength gradually falls from its maximum value to the minimum value, equivalent to those shown in Fig. 1, through a nearly straight line curve. The elongation and deformation values are found to maintain very close relationship and no abrupt deviation occurs as with the harder filmed material. With this type of varnished cambric an operator would be able to insulate a very irregularly shaped conductor with a very smoothly pulled and well built-up body of tape yet not be in danger of seriously lowering the dielectric strength of the varnished material.

MOISTURE and oil resistance are two characteristics which are difficult to express as numerical values. It is more reliable to employ these as comparison values only; running two or more sets of samples simultaneously. These will give fairly comparative values when the percentage increase in weight due to water absorption after immersion is considered. A numerical value for water resistance can be obtained by running the dielectric strength tests before and after immersing the samples. The percent loss in puncture voltage can be calculated but difficulty is found in duplicating test results. To determine the resistance to oil the samples after having been immersed in oil at a given temperature and for a given time may be examined for their resistance to abrasion. The oil in which the samples were treated usually shows discoloration. This may be studied in a color comparator and values set.

Closely allied with moisture resistance we find the power losses. There is an inverse relationship in these two qualities. That is, when a material shows higher resistance to water absorption the power loss will be found to be lower than that of a sample less resistant to water. Considerable interest in this characteristic is being shown by purchasers of varnished cambric with the result that the water resistances have been greatly improved recently.

The desirable characteristic of fractional power factor as found in insulating oil impregnated paper insulation is held as a guide for the makers of varnished cambrics and some very interesting and highly successful work has been done in reducing the losses of varnished cambrics. A glance at the "Power Factor Characteristics" curves in Fig. 3 shows some of the possibilities in this work. Curve No. 1 indicates the variation of power factor at various working temperatures found by testing one grade of black varnished cambric. It is to be seen that at the ordinary working temperatures the losses in this material would be very high. Curve No. 2 shows losses found in a highly similar material. The fabric was identical but the varnish was so treated as to increase its resistance to moisture. This material used in developing curve No. 2 might be considered as representative of the better grade of black varnished cambric used in cable maintenance and general insulation; especially for lines carrying such voltages that power loss may cause sufficient heat to affect the material.

Consideration of all these salient points is essential in choosing the material which is suitable for application to the given task. The value of dielectric strength has long been considered of greatest importance to the engineer, but this test is being reduced rapidly to a position of secondary standing and the power loss attracts more attention.

THE task now confronting the insulation engineer is the same as he has had since the industry started. The main differences between today and the early days of electrical power transmission are the ever increasing loads and higher voltages. Lines are laid for a given rated load, the demand on this line grows and the copper is worked at such a current density that heating results. This heat, together with that caused by the losses through the fabric jointly work to destroy the insulation. When the fabric is correctly designed it is able to withstand these destructive agents.

To design a material to meet these new demands one is driven to greater and greater expense. The cambric must be of a high grade carefully woven type. The varnish requires very careful selection of gums and oils, and great skill is required to compound them. These two raw materials must be so processed in the treating tower that the varnish film is continuous and smooth on the surface and the weave of the fabric well filled by the impregnating action of the varnish. The fabric must have retained practically all of its original tensile strength and in the bias cut fabrics must retain a high degree of elasticity.

It is reasonable to expect a rapid increase in the desirable characteristics of varnished cambric. It will follow as most other items, the trend of the times. More demands being made on it will call for more research work and developments will grow which will produce materials that will fill the requirements which the application imposes.

Government Seeks Distribution Data

(*Continued from page* 43)

4—In general, the information can be used to show the strengths and weaknesses of the distributive system and to aid in the further elimination of distributive wastes.

The Census Bureau points out that the completeness and promptness of the census can be advanced if merchants are urged to prepare themselves to answer promptly and accurately the questions to be asked by the enumerators. A special urban field force of more than 5000 enumerators is being used in addition to the regular population and agricultural enumerators, who will canvass the rural districts.

Distribution is one of the electrical industry's most important problems. Here lie the greatest possibilities of profit or loss, and increased efficiency. "A complete revolution in wholesaling and retailing practice is taking place (the chain store is one example," says the Census Bureau, "but the problem is so vast and our information so meager that the extent and direction of these changes is only guesswork. Greater knowledge of tendencies and conditions as they now exist is needed to help distributors to avoid inefficiency and to keep pace with modern practices in manufacturing."

Every dealer in the country will be canvassed. Each will be asked questions concerning his business, his employees, his total inventory and the kind and volume of his sales. He will be asked for the chief items of his expense, but no attempt will be made to discover the amount of his profit.

As the Editor Sees It

Stanley A. Dennis, *Editor*

Think Twice Before You Fire

ONLY a hopelessly blind optimist would deny that distressing unemployment exists in the United States today. Administration officials in Washington admit that the unemployed number probably 3,000,000. Yet in the face of such a condition certain facts must be kept in mind.

For one thing, reliable records indicate that the present number of unemployed is only about half of what it was in similar crashes in the financial history of the country. It is said, also on good authority, that the number of unemployed workers in February was lower than in December.

Again, if there are 46,000,000 employed persons in the United States, as has been carefully estimated, then certainly 43,000,000 of them are at work.

Further, it should be remembered that the great construction programs scheduled for this year and speeded up under the initiative of President Hoover cannot be launched in a day or a week. Government and private projects are now in the blueprint stage, and active work may be expected to get under way only with the coming of spring and the assurance of dependable weather and working conditions.

Probably the situation would be twice as bad as it is if it had not been for the cooperation which business has given to the President in his effort to stabilize wages, encourage the earlier scheduling of construction projects and hold unemployment to a minimum.

It might be well to keep in mind, also, that industrial and commercial leaders, financial experts and experienced students of business conditions and history seem to agree that the upward curve of business will come sooner and be somewhat sharper than is generally expected. Undoubtedly the failure of Congress to take action on the tariff is a factor in slowing down the return of business to normal conditions. Fortunately, definite action seems to be in sight.

Employers of skilled and unskilled labor, therefore, may find it to their advantage in the long run to think twice before laying off or discharging employees. The unemployed American working man has always shown a willingness and a readiness to shift quickly his place of work and residence. He is likely to continue to do so. In this respect he differs greatly from the working man in England and other European countries. Employers who follow the line of least resistance and lay off valuable men now may find themselves seriously handicapped when the upward swing of business comes with the final breakup of winter.

Financial Support for Shows

SOLICITATION of manufacturers for financial support for appliance and radio shows, exhibits and expositions sponsored by local, sectional and national organizations and scheduled for the late summer or autumn has already begun. And already it is evident that while support in some measure may be forthcoming, it is not likely to come forth quite as readily as it has in former years.

Manufacturers are coming to a realization that both electrical appliances and radio have lost the keen novelty appeal that they once held for the public. Curiosity can no longer be aroused nor satisfied by worn-out tricks. The woman in the home is no longer thrilled at the mere mention of an electrical appliance or a dynamic loudspeaker, if she ever was. No longer will the polished appliance solemnly arrayed against black velvet draperies draw a crowd or dollars. It is not a secret that for several years shows of all kinds have been steadily falling off in attendance, receipts and orders. Hence, the hackneyed form of radio or electrical show, which once drew countless thousands, is doomed. The sooner it is buried the better for everybody concerned.

The trouble, when all is said and done, lies not so much with the public as with the industries promoting the shows. Too often the electrical or radio man has assumed that the public is just as interested in his product as he is, and he has therefore failed to get his show across. Too often and too long have shows been characterized by a total lack of imagination and knowledge of human nature on the part of both management and exhibitors. Both have been and are mentally lazy.

And yet, the possibilities of the show idea have by no means been exhausted. The idea seems to be awaiting the attention of somebody with new imagination, a flair for showmanship, a sense of the dramatic, a facility in handling the human interest appeal, and a new bag of tricks. It can be done. Shows can be bigger and better than ever before. But they must be different than heretofore. They must satisfy other motives than mere curiosity. They must make greater use of the appeal that lies in the applications and uses of the products displayed and their practical value to the purchaser. When business ceases to think of a show merely as another form of high-pressure selling, we shall have even more successful shows than we have had.

It comes down to this, as far as manufacturers' support is concerned: No support should be forthcoming for the ancient and moth-eaten type of show. And ample support should be given to the show that seems likely to be something different, out of the ordinary, and a real step forward in business showmanship, one that makes a unique appeal to the public and holds forth unusual promise.

Uniform Accounting

UNDER the direction of Thomas W. Howard, who is in charge of uniform accounting work, the National Electrical Manufacturers Association has issued the first of a series of bulletins intended to bring about uniformity of accounting procedure by the member companies of Nema. The association has sponsored this movement for several years, but the desired uniformity has not yet been attained. Certainly here is a movement which deserves the hearty cooperation of *all* Nema members. Mr. Howard is splendidly equipped to do the work to which he has set his hand and mind, and it is to be expected that Nema member companies will cooperate enthusiastically. Incidentally, the effort of Nema to improve manufacturing accounting methods is just another reason why non-member companies might do well to consider enlisting under the Nema banner.

Ready to Apply

Eight liftable ideas for cutting costs or simplifying the day's work of the electrical manufacturer

A Merchandising Idea Worth Applying

ANYONE who passes an excavation either for a humble drain or a lofty structure is impressed with the intense interest labor of any kind has for the average pedestrian. Capitalizing this interest the Apex Electrical Manufacturing Company put 12 factory employes into a Cleveland department store with sufficient raw materials, fixtures, work benches and tools actually to manufacture the essential parts of motors, heating elements and ironer rolls employed in the assembly of its ironer.

Raw material in regulation tote boxes was delivered each morning to the department store, and the day's production, finished, tested and inspected was trucked back to the factory each night.

The exhibition was maintained for ten full store days and the interest never lagged throughout the entire period. E.H.A.

Less Muscle Work

ELECTRICAL manufacturers in common with others have the problem of cutting down wasteful, non-productive picking-up-and-putting-down operations. One way of doing it is shown in the illustration at the right.

Formerly, in moving material between main and branch plants, a concern loaded material into and out of its motor trucks piece by piece. Then somebody thought of the scheme of using skid platforms upon which were mounted removable box sections. In this way as much material may be carried per truck load as formerly.

And at each end of the truck run a lift truck quickly conveys the material to the point needed. This has the advantage, too, that the motor truck is tied up during shorter periols for loading and unloading—a situation much to be desired, for motor trucks pay for themselves only when they are kept on the move. L.S.C.

"No Sinecure"

NOWHERE perhaps, has there been expressed more clearly and in fewer words the real qualifications of a director of safety work than in the statement of W. H. Cameron, Managing Director of the National Safety Council. He says:

"He must be a diplomat, able to argue successfully with porter or president. He must be an organizer who can influence others to do the work. He must have vision, tact, the zeal of an evangelist and the common sense of a LINCOLN. He must be a sticker, and yet be able to 'trade votes' advantageously. He is the company to the workmen: he must appeal to them on a common ground of mutual understanding and good fellowship, in spite of any disagreement between men and management. His is an intensely human job and no sinecure."

Surely this is no mean set of requirements. It requires almost a superman to meet them, but they constitute an excellent ideal to approach as closely as possible. L.I.T.

A Stunt from an Electrical Repair Shop

WHEN issuing from stock a measured coil of wire not knowing how much is required, we use a small platform scale measuring the amount in pounds and ounces.

We then mark on a tag which is filed until the remainder of the wire is returned, the original weight of this coil of wire.

When returned to stock, the returned amount is again weighed, which gives a ratio between the returned amount and the original. If one can use a slide rule, this proportion can then be applied to the original number of feet in the coil which will give the returned amount. The difference is the amount used on the job.

In this way practically accurate measurements are obtained for sizes No. 14 and larger, without the necessity of actually measuring the amount returned.

In itself this is only a little stunt but it is truly surprising the amount of time it saves in the course of a month. L.S.

Cuts Loading Time

Goods on skids are quickly loaded. And none of the tedious piece-by-piece handling

Simple, But It Saves Money

SCRAP material, whether it be sheet metal from punch presses or paper from dieing-out operations, bulks up and so introduces a problem particularly when the material is fed into the machine as strips or large sheets.

One New England company had this difficulty until someone in the plant thought of the scheme of having an automatic knife installed at the end of the machine to clip the scrap up into small pieces just before it falls into the container.

Now, because the pieces are relatively small they pack readily into small space. That this is quite an element is evident from the fact that in one department of this plant it formerly required the full time of three men to remove the scrap which collected at the machines. Now one man handles this work easily.

So successfully has it proved out in this company that now all of its machines are so equipped. G.N.T.

Manufacturing in a Department Store

The maker of an electrical ironing machine puts on a production exhibit

Do Your Jigs Meet These 13 Points?

MUCH of present-day welding is done in jigs, which thus become an important item of plant equipment. Economy, speed, standardization of the product, and regularity of the welding operation are the principal advantages that are gained by the use of jigs.

In designing a jig to fit a special application of welding all the following items should be kept in mind as the basis for the ideal welding jig and as many as possible of these features should be included in its makeup

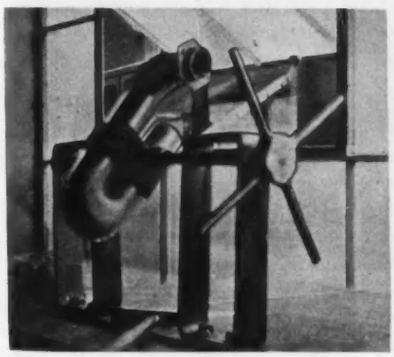
An efficient welding jig should:

1. Hold the work pieces positively in position.
2. Be made so that the work can be quickly inserted and removed.
3. Make impossible the insertion of the work piece in any but correct position.
4. Provide devices for rapid and steady clamping and adjusting without undue effort.
5. Allow no spring in the work piece from clamping operations.
6. Allow no buckling, warpage, or other distortion from expansion or contraction due to the heat of the blowpipe.
7. Permit inspection of the weld if necessary.
8. Be easily cleaned, and have faces which will hold without marring the work.
9. Be as light as is consistent with the rigidity and strength necessary in such equipment.
10. Be easy to handle and not unwieldy.
11. Be safe under any and all circumstances.
12. By its construction or location, permit the welder to work without any undue inconvenience or unnecessary fatigue.
13. Be movable, if possible, so that all welds can be made in a horizontal position.

U.C.C.

Many Advantages Besides Light Weight

WHILE aluminum received its first ready acceptance because of its light weight, this quality is only one of many that have since made it an important material in the electrical industry.



In and Out Quickly
Jigs help do a better welding job

Besides, They Save Space
The 39 soldering irons in this assembly line are plugged in at the far side of the bench

Take paint: in making a serviceable paint, it has a large value because of unusual properties. Ordinary paints are made up with pigments, the particles of which are granular in shape. A well-made aluminum paint has a pigment base quite different from such pigments.

The aluminum bronze powder is made by stamping aluminum into small, flat, very thin metallic flakes. When this is mixed with a suitable vehicle, such as oil or varnish and is brushed or sprayed on iron, steel, wood or even brick and concrete, these tiny flat flakes overlap one another at the surface. Thus they are said to "leaf," which is to arrange themselves layer upon layer, much as falling leaves do.

Thus a metallic coat of mail is formed which has high light reflecting qualities, is waterproof, non-rusting, and very durable, besides being attractive in appearance.

The fact that this layer is also opaque is important, since it protects the paint vehicle underneath from the damaging effect of sunlight. And it is this effect which is responsible for much of the failure of paint.

Furthermore, this opaqueness gives this paint a high covering power. One coat will completely hide a black surface.

Thus it is that this paint is lengthening the life of many kinds of outdoor structures. And the fact that it holds its color and is resistant to fumes and gases, and can be readily washed, makes it excellent for many trying indoor uses as well.

These qualities have caused electrical manufacturers to use this paint with good results for the protection of transmission towers and for exposed transformer boxes besides the coating of fuse boxes, switch panels, meter boxes and instruments of many kinds.

No Piping and No Fumes

SINCE the modern radio set is exceedingly compact in size the wiring connections often present a problem. And they must be made thoroughly secure.

Browning-Drake Corporation of Waltham, Massachusetts, manufacturers of a high quality radio receiving set, find that the best method for soldering a wiring connection which will remain intact is by the use of electrically heated soldering irons.

An assembling section of their factory is shown above. Each operator has an electric soldering iron. Separate convenience outlets are located on the outside edge of each bench section for ease of plugging in.

Thirty-nine electrically heated soldering irons are used in the plant. Each iron is rated at 100 watts. By using electric soldering irons, adequate heat, at a satisfactory temperature for soldering, is supplied. There are no gas flames to adjust, no fumes to contaminate the atmosphere, no hot flame to heat up the room and make working conditions uncomfortable.

Electrically heated soldering irons are most convenient in that they can be attached to an electrical outlet, thus eliminating any necessity of piping. Moreover, they are available for many varied uses, being manufactured for light, intermediate or heavy duty and rating from 70 watts to 600 watts capacity.

The types of electric soldering irons include the hatchet, spear and point tips.

J.J.B.

Perhaps you too have worked out little cost-cutting plans which are of value. If so, turn them in for use in this idea-exchange—a feature appearing each month in ELECTRICAL MANUFACTURING under this heading, "Ready to Apply". Ideas accepted will be paid for at a liberal contribution rate.

Developments in Voltage Recovery in Arc Welding Machines

An explanation of some recent discoveries in the better performance of direct current welding machines to increase speed of operation

By A. F. Davis
Lincoln Electric Co.

THE development of arc welding, both in design of equipment and application of the process, has been so rapid that most questions which were real problems a few years ago have now been solved. However, one baffling question has been how to decrease the time for voltage recovery in direct current welding machines. By "time of voltage recovery" is meant the length of time for the welding machine to recover full open circuit voltage from short circuit. The quicker this recovery the more nearly will voltage changes in the machine follow the voltage changes of the arc and the net result is an easier operating arc, which means more work with less fatigue.

While in 1927 there appeared in some technical papers an article dealing with the fundamental principles involved in reducing the amount of time it takes for a welding machine to produce its change in the voltage when welding, the Research Laboratories of The Lincoln Electric Co., Cleveland, Ohio, began work on this question in 1924 and it now appears have a solution as a commercial possibility in the not too distant future.

It is a law of electric circuits that the induced current always flows in such a way as to nullify the magnetic effect of the inducing or original current in the first winding.

As a result of this action, ordinarily the machine will not adjust itself to the changes in the voltage of the arc as quickly as it can if the internal transformer action were eliminated. It should be understood that the changes both in the voltage of the arc and also the machine, are extremely rapid, taking place in fractions of a second.

The oscillograph, shown in Fig. 1, shows the length of time consumed in recovery of voltage from zero or short circuit to 95 per cent of final voltage in one of the standard arc welding machines now on the market.

The recovery shown is quite rapid and much shorter than found with the average type of machine. Various devices have been and are used to overcome the effect of this transformer action in the arc circuit. It is easily appreciated that if the nullification of this transformer effect can be accomplished in the machine, results would be better.

Experiments have shown the possibility of inserting in the arc circuit a device which will produce effects similar to those produced in the machine by the transformer action of the double winding on the pole pieces, except that the effect will be in the opposite direction, thus nullifying the original transformer action.

The oscillograph, shown in Fig. 2, shows the results where an experimental device, such as that described, was used, and it will be noted that the length of time for the voltage to rise from zero or short circuit to 95 per cent of its final voltage is very much reduced.

Ordinarily when a welding machine is short circuited the instantaneous short circuit current will immediately rise to a considerable higher value than is desired for the best welding operation. In ordinary welding with the metallic arc, the machine is being short circuited intermittently from perhaps 15 to 30 times per second by globules of molten metal touching both the electrode and the work. These peaks of current occuring at short circuit cause considerable higher heat loss in these molten globules than is desirable, causing the globules to boil or explode. The welding operator calls this "spatter."

By nullification of the transformer effect the overshooting of the current at the time of making a short circuit is reduced and experiments show, made almost zero.

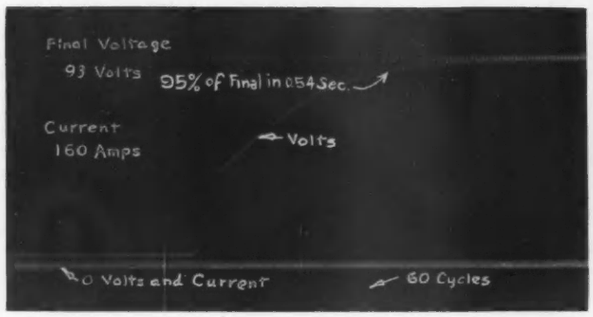


Figure 1

An oscillograph showing the length of time consumed in the recovery of voltage from zero or short circuit to 95 per cent of final voltage in one of the standard welding machines now in commercial use in manufacturing plants

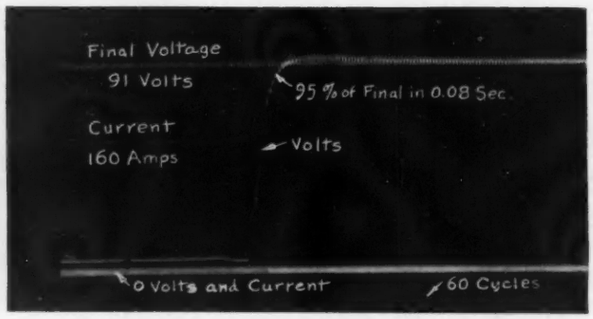


Figure 2

An oscillograph showing the results obtained with an experimental device, indicative of the time required for the voltage to rise from zero or short circuit to 95 per cent of the final voltage, as compared with present machines

Small Motors Need Overload Protection

Aside from the mechanical protection of small motors there is the factor of human safety that must be taken into consideration

By F. E. Foisey and E. M. Carville
Westinghouse Electric & Mfg. Co.

THE protection of small motors against damage due to overload is essential, just as big oil circuit breakers protect the transmission lines of large power systems. Small motors are used in so many and varied applications, and so little is known by the average layman and manufacturer of motor driven appliances about the care of these motors, that it is necessary to educate them to the fundamentals of motor operation and protection.

Until a few years ago it was not considered essential that provision be made for protecting small motors against overloads other than that afforded by house fuses. Other larger equipment has generally been provided with suitable protection and besides has been used by people more familiar with electrical equipment. The small motor has been used by those who have had the least opportunity to become familiar with electrical devices, and the protection provided for it has been very inadequate. Appliances such as refrigerators, small grinders, farm motors, pumps, etc., were equipped with snap or toggle switches without overload protective features. In some cases, washing machines had no switch at all provided, and the user had to insert the plug, on the end of a ten foot cord, into a convenient outlet to operate the washer.

A small overload protection device attached to the motor of this power scraper is a safeguard against the burning out of fuses and possible mechanical damage to the motor

Just as there is an endless number of applications for the small motor, so adequate protective devices are needed to break these motor circuits on overloads as a matter of safety.

On the wringer types of washing machines peak overloads are often caused by heavy material passing through the wringer or by the clothes becoming bunched. Should the motor carry the load past the peak quickly, the protective device will not stop the motor. If, however, the motor stalls, thereby inviting a motor failure, the protective device disconnects the power supply and notifies the operator that the obstruction should be cleared. While house fuses are used to take care of such overloads, they are unreliable because oftentimes the user has overfused and may even have bridged the fuse block with a "penny." The fuse may have been weakened by some previous overload, which might cause the circuit to be opened without provocation. Also it must be remembered that many persons unfamiliar with electrical devices do not care to put new fuses in a fuse block, and a burned-out fuse means a call for the service man.

The same conditions applying to the washer can be caused on an ironing machine by overloading the rolls. Such applications are better served by automatic overload switches.

Oil burners differ from washers and ironers in that they operate at various times throughout the winter and without much attention. Automatic temperature control through relays start and stop operation. Motor protection is necessary and generally this is provided by safety switches with cut-outs. As a matter of convenience and assurance of continued operation, the protective device used should be of a type that does not need renewable cut-outs. Thermally operated circuit breakers are ideal for this application since they can be reset at once by anyone, without any danger from shock.

The refrigerator is an appliance similar to the oil burner as to long-hour service, and the safety switch with a cut-out is not as desirable as the thermally operated circuit

breaker. The refrigerator motor needs protection due to the possibility of its having to start against a heavy overload, under certain conditions, as for example, when the power is interrupted for a short time. Overloads liable to damage the motor would have been stopped in a few minutes by the automatic control. Some refrigerators depend on the house fuses for motor protection. As pointed out in the discussion on washing machines, such protection can be made ineffective by over-fusing. There is a tendency now for the refrigerator manufacturers to adopt built-in, thermally operated circuit breakers.

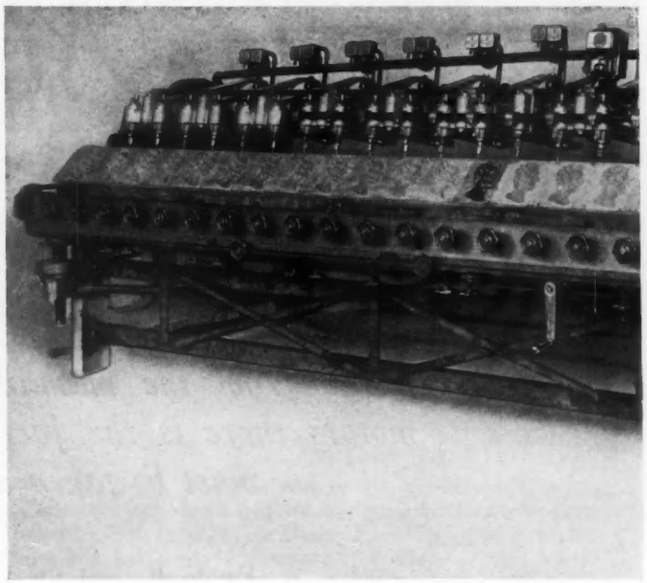
There Are Many Domestic Applications for Small Circuit Breakers

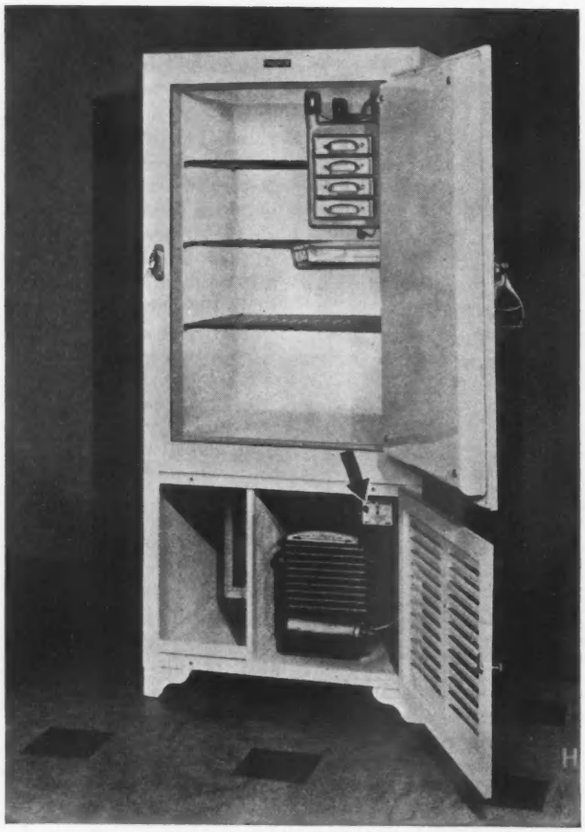
Automatic water systems receive very little attention, and in cases of power interruption, which may be expected at certain intervals on a rural service line, the motor may be called upon to start on an overload. Overloads due to starting in cold weather when the oil is thick and bearings dry, are liable to damage the motor. This damage can be eliminated by the use of a thermally operated circuit breaker.

On domestic stokers, garage door openers, small ice chipping machines, ice cream freezers, small meat grinding machines, etc., automatic protection of motors with the manual reset feature is very desirable. These applications are by their very nature subject to sudden overloads or stalling. Fuse protection would be inconvenient and costly as well as questionable on account of the tendency for over-fusing.

A combination single-pole surface switch and thermally operated circuit breaker has been designed for manual control and automatic protection of small motors and is listed by the Underwriters Laboratories.

The breaker is made for several current capacities in order to provide suitable protection for various ratings of different types of small motors. The ampere marking on the nameplate corresponds to the guaranteed current limit which the breaker will carry continuously without tripping. At this or lower current values the breaker functions the same as an ordinary disconnect switch. The functioning of the breakers is affected by current alone, and the voltage is immaterial, providing the voltage is not in excess of that marked on the nameplate. This voltage limitation is due to the maximum heating capacity as determined by Underwriters' specifications for temperature rise of contacts when opening the circuit. All ratings of breakers are similar in mechanical construction, the only difference being in the thermal strips and the spring which actuates the disconnecting mechanism.



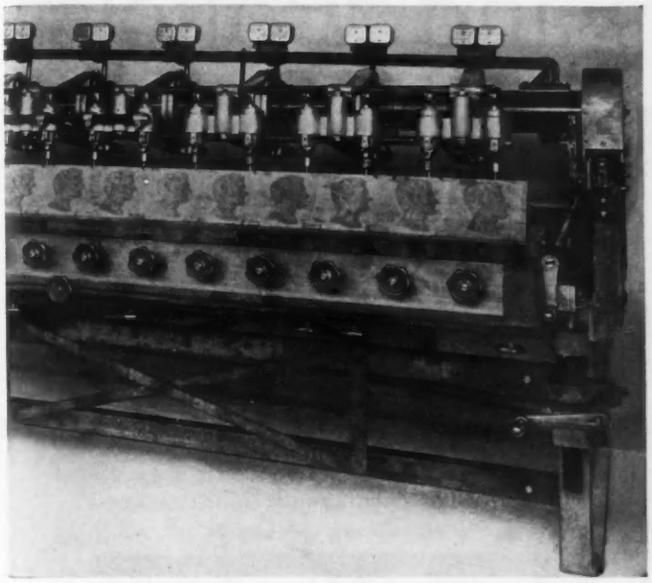


The Possible Damage to a Motor Is Proportional to the Overload

Operation of the breaker depends upon the heating of the bi-metal strip within the sealed case. It has long been known that different metals have a different coefficient of expansion. If two different metals are laid together and joined at the ends and the bi-metal strip thus formed is subjected to heat, the strip will curve due to one of the metal pieces becoming longer than the other to which it is joined. In the breaker a latch carried on the free end of the bi-metal strip disengages a lever and allows the breaker to open when the bi-metal strip is heated sufficiently.

Motor current is carried through the bi-metal strip so that the heating of the element depends directly upon the amount of current being carried by the breaker. A current below the nameplate rating of the breaker will not heat the strip sufficiently to release the latch and open the switch. For any current much above this value the heating will bend the bi-metal strip enough to open the switch. The actual time required to do so depends upon the actual amount of the current. The damage that is done to a motor depends not upon the amount of overload it is called upon to carry, but rather upon the amount of overload and length of time, both of which must be taken into account. The time element of the breaker is so adjusted that a sudden peak load on the motor will not open the circuit. On heavy overloads the breaker will open in sufficient time to

THERE is a need for protection on practically every small motor driven device or appliance in use today. At the left is a typical installation of a small circuit breaker as it is attached to a domestic refrigerator, while the view above shows another type of application to a large woodworking machine having motor driven cutting heads



prevent damage to the motor. As a concrete example, let us assume that a split phase motor with a normal full load current of 4.7 amperes is operating a garage door opener. This motor requires at least 20 amperes at start. A breaker rated 8 amperes continuous will allow this motor to come up to rated speed, which the motor will normally do within 2 seconds. Let us assume that the door has become stuck because of ice and the motor is stalled on the line. The breaker would act, due to the locked rotor current caused by this condition and as the current would be approximately 20 amperes the circuit would be cleared in 5 seconds. If the voltage dropped so that the current was only 15 amperes with consequently less heating of both motor and bi-metal element, the circuit would be opened in 15 seconds.

Small Thermally Operated Breakers Are Applicable to Many Types of Motors

The type of motor, voltage and speed are determining factors in breaker application. It can be readily seen that ambient temperatures should be considered to some extent for applications in cold places or near ovens.

The split phase motor requires a higher rated breaker for a given motor rating than the other types because of the high starting current required for a given starting torque. With the advent of the new starting current limitations and the resulting more closely rated split phase motors with regard to starting torque the provision for suitable motor protection is becoming of prime importance.

The repulsion-induction motor has a low starting current as compared to its full load current and therefore a lower rated breaker will allow it to come up to speed. The lower rated breaker will give protection for smaller overloads than the locked rotor condition.

Direct current motors can be provided with protection to a degree somewhere between that afforded repulsion-induction and split phase motors.

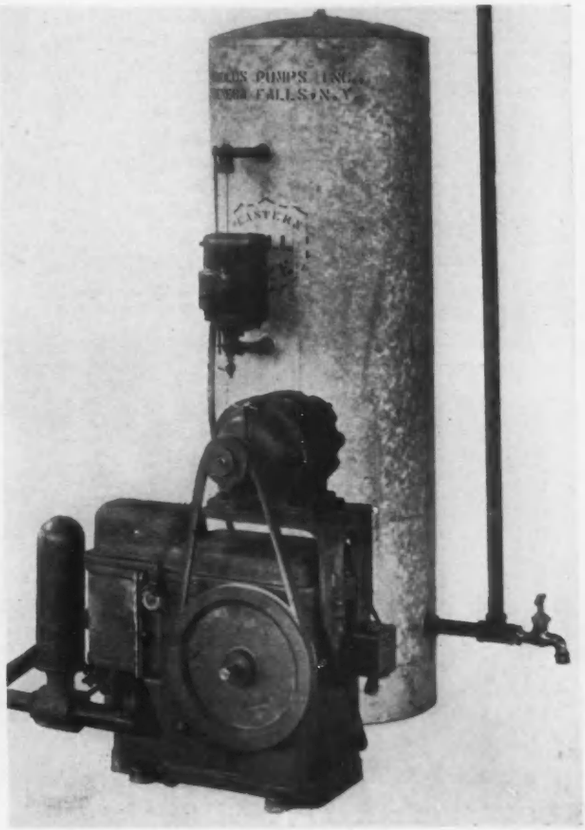
IN the home overload circuit breakers attached to water pumping equipment, clothes washers and other motor driven devices afford safety for the motor as well as the user. They also eliminate such dangerous practices as over-fusing with the possibilities of fires and other hazards, which repeatedly occur where this practice is followed

There are certain features desirable in a protective device and switch to be used by people more or less unfamiliar with electrical equipment, and a few of these features will be mentioned. After the breaker has been carefully calibrated it should have the working parts sealed so that no one can tamper with them. If the bi-metal strip is bent by an external force the effect of heat upon it becomes erratic and the breaker is no longer accurate in operation. Also if bent sufficiently the protection provided is unreliable and enters the same classification of the "penny" fuse, if bending is extreme. The breaker should be indicating, i.e., not only be marked for "off" and "on" but indicate at a glance whether or not the thermal element has tripped the mechanism. If the breaker has functioned due to an overload it affords a warning to the user to investigate before again attempting to start the motor. The breaker should be quick acting, have rugged, long-life contacts, have no current carried by the actual operating mechanism and be suitable for a hand operated switch for normal starting and stopping the motor. The breaker should be so provided that high instantaneous voltages caused by opening inductive circuits will not cause an arc between contacts.

Some of the Advantages Accruing from the Use of Small Circuit Breakers

The advantages of protecting small motors by inserting circuit-breakers in the line, such as those described may be summarized as follows: Accurate protection, elimination of fuses, low first cost, removes incentive to overfusing, prevents costly damage and saves time, compact and of good appearance, is an additional selling point for appliance manufacturers.

Such small thermally operated circuit breakers are easily applied to any type of small motors and even in cases where it is necessary that the breakers be exposed they do not make the installation unsightly. Aside from this there is the matter of safety for the user of the appliance or device to which the breaker is attached. It is generally well known that many accidents and often disastrous fires have been caused from overloaded motor circuits, and this one feature alone should warrant the application of some such protective device.



Methods and Policies

If their method of making it possible to go after a damaged motor even in the middle of the night were the only information in the article it would be worth reading. The simple cost record system, too, may well be applied by the other fellow with profit

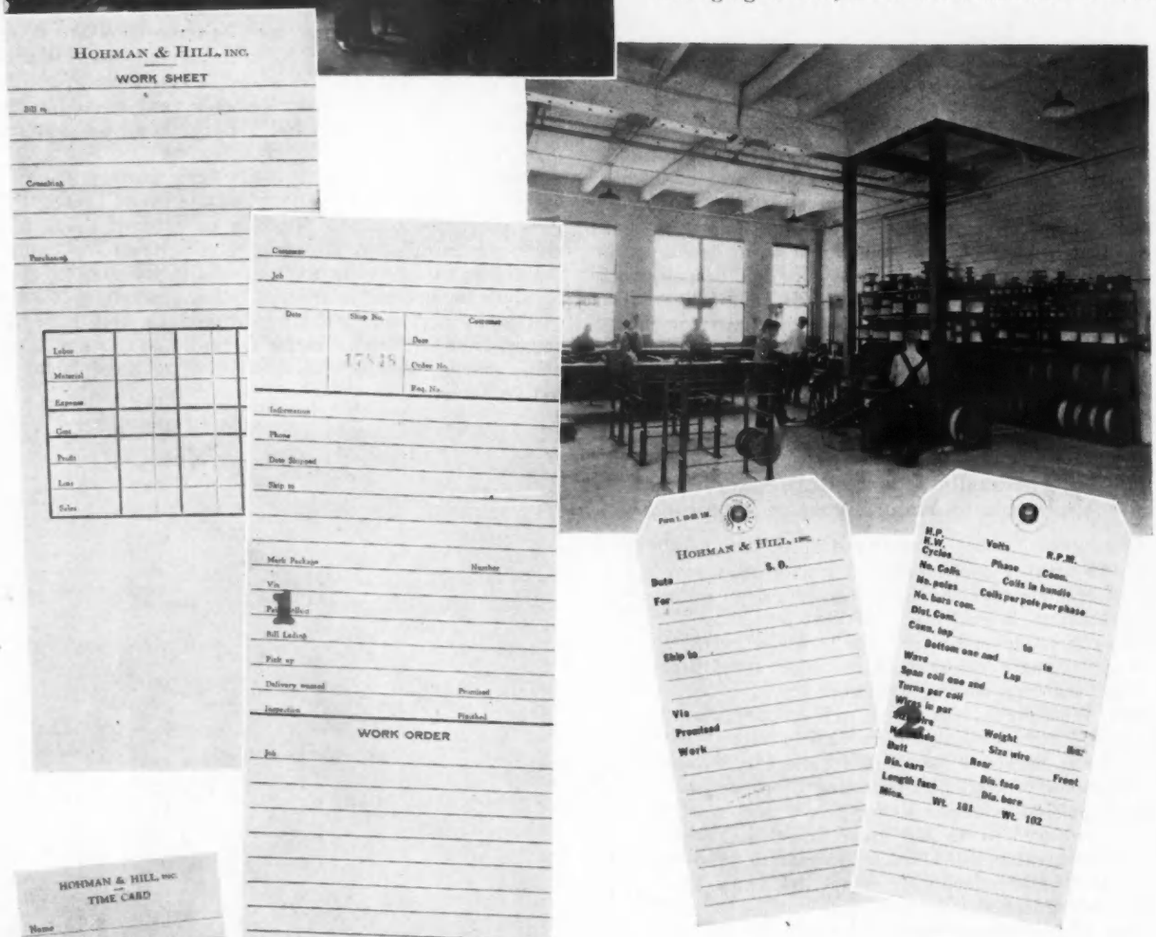
By S. A. HOHMAN

President, HOHMAN & HILL, INC.

As Told to

LEON I. THOMAS

Managing Editor, ELECTRICAL MANUFACTURING



1. *Each job has one of these work sheets. On it, besides instructions for the job, are spaces for posting of information from the time cards*

2. *This tag is of linen. It goes to the job and stays with it until the job is finished*

3. *Each day that a man is engaged on a given job he makes out a new time card*

that Helped Us Build Our Motor Repair Business

WE STARTED our business of repairing motors in 1923, and I presume our early experiences in getting our feet firmly on the ground were not far different from those of many another repair concern. Practically all businesses that amount to anything have had to go through rather dark days of struggle.

Starting from scratch, the launching of such a business is not unlike that of a young doctor. True, a motor repair concern is not prevented by medical ethics from going out after business, but at that there is no seasoned clientele to fall back on—no long record of jobs successfully accomplished, which help so much in getting new business after one is well established. So at the start, while we scrambled for business, there was somewhat of an analogy to the young doctor waiting for business to come.

That in time the business did come is evidenced by the fact that three years ago we had so outgrown our former quarters that we moved into our present two-story, 50 by 125-ft. building which is pictured in connection with this article. But I shall come to some of the details of that building a little later.

I suppose our experience runs true to that of many another motor repair shop in that an obstacle in getting all the business to which we think we are entitled is the existence in so many plants of the "handy man" who considers himself fully capable of handling electrical repairs.

And the pity of this situation is that since these people, in order to make the repair in question, are taken from other work to which they are infinitely better qualified, the costs to the employer are far greater than they seem on the surface. And, in addition, the fact usually remains that the job finally has to be redone by fully qualified repair people.

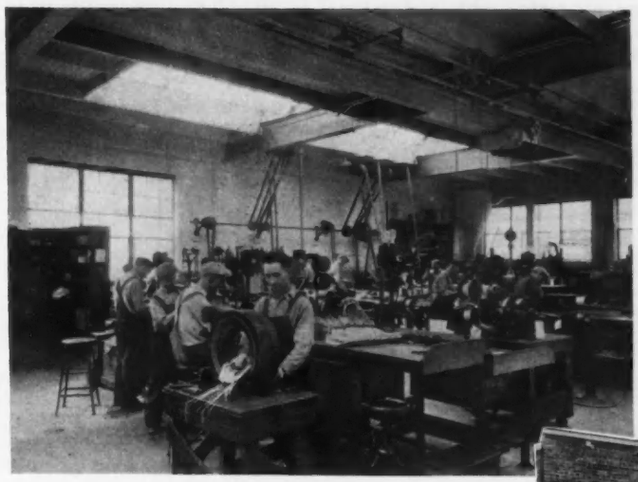
It is to this situation that no small part of our selling has to be directed. Besides the business which comes as a result of past successful performance, selling with us is accomplished through four salesmen. But this is not as easy as it sounds, for the reason that salesmen fully fitted by experience to sell motor repair service are not to be found in a minute. In fact, they must usually be trained, which means that the first six months on the payroll are non-productive months.

In addition to the efforts of our salesmen in getting business is a direct mail campaign, which we find rather effective.

There is in Chicago a Plant Maintenance Club made up of the maintenance people of many of the city's prominent manufacturing concerns. It is the custom of this club to meet around at the various plants where there is something to be learned of mutual value to its members.

We had the pleasure not long ago of entertaining this club for one of its evening meetings. This gave the members an opportunity to see at first hand how motor repairs are executed in a modern motor repair shop, and, incidentally, was of value to us in making ourselves and our services better known throughout our territory.

But, after all, our best advertisement is a job well and quickly executed. Part of our ability to get on the job quickly is due to an arrangement we have with the driver of one of our trucks. He lives next door to our plant, and in his house is an extension from our telephone switchboard. Thus he receives any call out of plant hours. Upon receiving it he promptly calls the workmen involved,



(Upper left, opposite page) This department specializes in the making of carbon brushes for practically all types of motors

(Right picture, opposite page) An ample supply of wire in all sizes handily arranged facilitates work in the coil winding department

(Above) Monitors in the roof provide plenty of light throughout the working spaces

(At the right) Through the door at the right motor trucks may deliver motors to and pick them up from a monorail serving the entire shop

From the large doorway in the left background a monorail leads to the traveling crane which serves practically the entire shop

if it is an emergency job, and then jumps into his truck to pick up the work. So by the time he is back at the plant the men are there to start on the job.

How this plan works out in practice is shown by an experience we had this past winter. There was a fire in a manufacturing plant at five o'clock one Sunday morning. This concern was at the time engaged in carrying out a contract containing a penalty clause. So it was doubly important that the plant be back in service at the very earliest moment.

By ten o'clock we had a gang of men in the burned plant with rubber boots on, sloshing around in the water left by the firemen's hose lines, pulling out the damaged motors. We would have been at it sooner had we not had to wait for the fire to be out.

Another thing that enables us to get at emergency jobs in a hurry is the fact that we carry a big stock of wire on hand in all the usual sizes. Thus, with us there is no delay on that score.

And once in the plant there is little trouble in getting the motors into work, for we have a monorail, which serves the shop, running from a point directly over the motor truck and connecting with a three-ton traveling crane.

A portable test bank also facilitates matters. Particularly is this so with the larger motors, where it would be a waste of time and effort to move them about the shop unnecessarily.

I should have explained that while the bulk of our business is in Chicago and immediate territory, we do go upon occasion as far out as 50 miles. We cover all points within this area by our motor trucks.

While our business started purely as a motor repair business, we soon found ourselves faced with requests from satisfied customers that we do special light and power wiring jobs for them. The result is that the contracting end of the business has grown of its own momentum to such an extent that it now comprises about a third of our annual business.

Of no small importance in developing a business is the use of a record system at once simple and effective. This, we think, we have, for it gives us accurate figures with a minimum of clerical work and what generally passes for red tape.

When an order comes in, a clerk in the office makes out a folder bearing the name of the job and the shop job number. Into this is put the work sheet (Figure 1). At the same time a linen tag (Figure 2) is issued, which goes to the job and stays with it until the work is finished.

On the front of this tag are spaces for the date, the shop order number, the name of the company for whom the work is being done, shipping instructions, date promised, and instructions as to what is to be done.

On the back are spaces filled out by the men who do the work. These comprise full data on the job in hand so that if at any later date any question arises it is only necessary to consult this tag to tell just what was done.

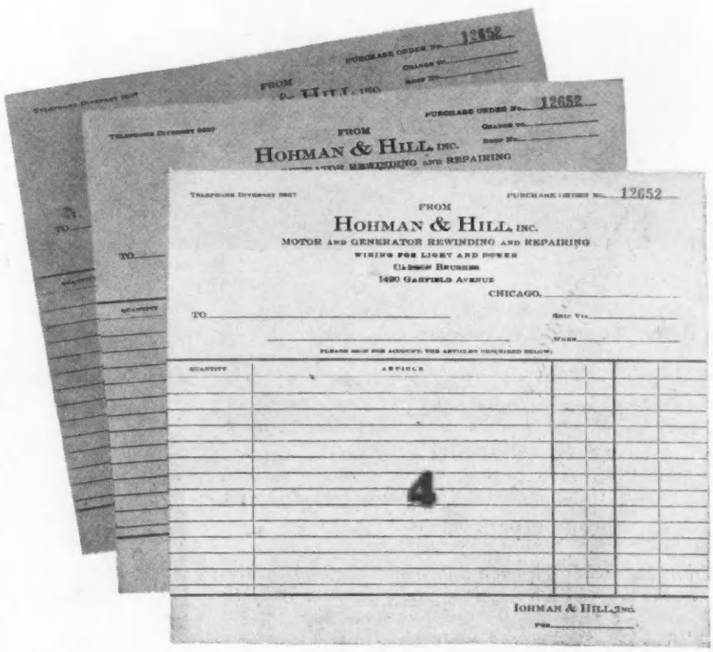
The folder mentioned in the third paragraph above is the one place where all forms, facts and figures associated with that job are assembled. Thus it is possible, both while the job is in process and later on, to locate all there is to know about the job in short order. It saves running here and there to different places in the files to locate the information as is necessary under some systems of repair shop routine.

When a man starts to work on the job he makes out a time card (Figure 3) and stamps it in the time clock. Each day that he is engaged on this job he makes out a new time card. On the back of the time card are spaces for material used. As these time cards are passed in each day they are accumulated in the folder.

When the job is completed the items on these time cards are posted by a clerk in the office to the work sheet (Figure 1).

IN case special material not in stock is required on the job, a requisition (Figure 4) is issued, and a copy of this, too, goes into this same folder. Thus everything associated with a given job is assembled in one folder in a readily accessible file as has been mentioned. It is repeated here because of the importance which our experience shows this to have.

Simple as these forms are, they readily suffice to keep accurate record on even the most complicated and involved of jobs, and that, after all, is everything one asks of a shop order system.



4. *In case special material not in stock is required on a job, this requisition form is issued in triplicate by the office*

What's NEMA Doing?

A department covering activities of the divisions, committees and sections of the National Electrical Manufacturers Association

Signalling Section Reorganized at February Meeting

The Signalling Section of Nema was reorganized at its February meeting, and Matthew Porosky, of Holtzer-Cabot Electric Company, was elected chairman, and Stewart N. Clarkson, of Nema headquarters, was chosen secretary. For the purpose of collecting and distributing information on business conditions within the signalling industry, the Section was divided into groups corresponding to products. These groups, with chairmen elected, are as follows:

Annunciators and accessories, Charles Auth, Auth Electric Specialty Company, chairman; bell ringing and toy transformers, R. Edwards, Edwards & Company, Inc., chairman; fire alarms, C. C. Skiles, Autocall Company, chairman; large bells, H. Appleby, Schwarze Electric Company, chairman; mail boxes, Irving Klein, United Metal Box Company, chairman; small bells, G. L. Patterson, Stanley & Patterson, Inc., chairman; telephones, A. J. Morrison, S. H. Couch Company, Inc., chairman; visual and code signal systems, George W. Rick, Holtzer-Cabot Electric Company, chairman.

The section chairman, together with the chairmen of the groups, will form an executive committee.

Floodlighting Section Elects

The newly organized Floodlighting and Airport Lighting Section of Nema, at a conference attended by representatives of nine manufacturers, elected the following officers: Chairman, J. C. Herron, of the Reflector & Illuminating Company; secretary, W. H. Robinson, Jr., of the General Electric Company.

Plans for the future work of the section include the preparation of standards and the collection of statistics, and it was decided to appoint two committees for this purpose.

Board Hears Statistics Plan

A plan to compile statistics covering the conditions of the entire electrical manufacturing industry at three-month intervals was considered by the Nema board of governors, and a committee was appointed to study the matter and report. President Collens pointed out the value of such knowledge to the individual manufacturer.

Section Council Meeting

The next meeting of the Nema Section Council will be left to the president and managing director to call. If there is sufficient business to be transacted, there will be a meeting of the council during the spring meeting.

Thomas W. Howard Joins Nema Staff

Thomas W. Howard, formerly of the Chamber of Commerce of the United States, has been added to the headquarters staff of the National Electrical Manufacturers Association as director of uniform cost accounting. As assistant manager of the Department of Manufacture, Mr. Howard had been in charge of field activities in uniform cost accounting. He edited the accounting manual of the American Drug Manufacturers Association, and for four years he was with the operating department of the American Telephone and Telegraph Company in Chicago.

Thos. W. Howard

He has also been associated in the past with the National Association of Farm Equipment Manufacturers, Northern Electric Company, Arthur Young & Company, and Griffenhagen and Associates, Ltd. Mr. Howard was a prize winner in the Scovell Contest on executive uses of cost data.

Place for Health Lamps

The Carbon Arc Lamp Section of Nema has been enlarged in scope to include the manufacturers of all types of so-called health lamps. The section will be renamed as a result of this change.

Standards Committee Notes

A number of Sections regularly publish definitions which apply to their products and, generally speaking, definitions serve a useful purpose. They explain terms which Nema uses and thus gives a more uniform meaning to them. However, like everything else, definitions are often overdone.

In some cases the meaning of a term is entirely evident by the combination of words used in the term itself, and further attempts to define it result only in narrowing down the meaning, which often is contrary to the intention of those who construct them.

It may be very desirable in some cases to restrict the meaning of a definition to specialized fields of activities. In other cases it is equally objectionable to so narrow them. Therefore, when defining terms for publication in our handbooks, care should be taken not to define terms whose meanings are self-evident, especially if such defining narrows the meaning to the disadvantage of someone else.

Standards Committee has approved several standards which were presented at the Washington meeting of the Air Circuit Breaker Section. These rules include definitions, rating standards and technical standards having to do with the construction of the inclosing case.

Standards Committee has recommended that the replies from the Motor and Generator Section to the letter ballot of the I.E.C. rules for Electrical Machinery 2 (Secretariot), 203 be referred to the Sectional Committee on Rotating Apparatus of which Nema is joint sponsor for further study before replying to the U. S. National Committee of the I.E.C.

Electrical Machinery Makers Asked to Aid in Report

Nema members who make electrical machinery have been requested by the A. I. E. E. Committee on Electrical Machinery to give assistance in the preparation of that committee's annual report on developments during the past year.

In order that no important development may be overlooked, all manufacturers are urged to submit to the committee brief accounts of developments with which they are familiar. The names of the manufacturers will be published to better identify the products.

The committee suggested that this be drawn particularly to the attention of those companies which do not publish annual articles regarding their developments, because in such cases importance advances may escape the attention of the committee.

The information should be sent to Carl M. Gilt, Inside Plant Engineer of the Brooklyn Edison Co., Brooklyn, N. Y., who has charge of preparing the report.

Uniform Contract and Proposal Form Is Drawn Up

At a meeting of the Molded Insulation Section of Nema held at the Statler Hotel in Buffalo on Jan. 14, a uniform proposal and contract form was drawn up. The representatives of twenty-three manufacturers of molded products who were present agreed on the desirability of adopting such a form, as a recommended practice of the Association, and it is being sent to member companies for letter ballot vote.

Facts, Figures and Trends

The Electrical Industry Looks Ahead

It is a good sign that among the most prosperous industries are those manufacturing machinery, including industrial equipment. The railroad equipment builders have at least a half year of good business in sight, the machine tool makers report a good demand from all machinery makers, and although the agricultural implement companies have had apprehensions on account of the short grain crop and a carry over of some types of equipment, they are now looking forward to a good year's business.

The manufacturers of electrical equipment are entering the year with their order books showing a very satisfactory volume. The machinery industry as a whole has a large amount of business in hand and is confident of another good year, according to the National City Company.

Railroad Electrification

Eighteen railroads in the United States, which formerly operated by steam only, now operate electrically on about 4300 miles of track, according to a survey of railroad electrification just completed by the Copper & Brass Research Association.

This electrification represents about 1900 miles of route, and of the 4300 miles of track approximately 3150 miles are main line track. In this electrified territory the railroads have in service 465 electric locomotives and 2750 multiple-unit cars for passenger service. Of these cars 2150 are motor cars and the rest are trailers.

Power Consumption and Costs

Seventy-five per cent of the power used in industry in the United States is now electrical, while in Germany 66 per cent is electrical, and in Great Britain 48 per cent of industrial power is electrical.

The average price of household electricity throughout this country is 28 per cent below pre-war levels, while the average cost of living has increased 70 per cent above the pre-war level. Based on the changed purchasing power of the dollar, therefore, rates are only about 42 per cent of their pre-war level.

Commodity Prices

For the fourth consecutive month the general level of commodity prices declined in January, with Bradstreet's index for Feb. 1 at $11,514. This represents a decrease of 1.4 per cent from Jan. 1 and a decline of 4.5 per cent from Dec. 1, 1929. The index is 11.3 per cent below Feb. 1 of last year and is now at the lowest point recorded since February, 1922.

Total National Income

The National Bureau of Economic Research places the total national income in 1928 at $89,419,000,000, an increase of $23,470,000,000 in the ten year period from 1919 to 1928 inclusive. The figure for 1928 is over three times the figure of 20 years prior to that. 1921 was the only year in the past decade that did not show an increase over the previous year in total income. In 1921, a period of heavy industrial

depression, the total national income showed a decline of between $10,000,000,000 and $11,000,000,000.

Of the total in 1928, the Bureau estimates that $32,235,000,000 was the income of wage earners; $17,823,000,000 went to salaried workers; and $38,296,000,000 was the return to entrepreneurs and professional men who might be termed as "employers" rather than employees. The remainder, or approximately $1,065,000,000, was paid in the form of pensions and compensations to unemployed laborers.

Losses on Installment Sales Decrease

Losses on installment sales during 1929 were exceedingly small, according to an investigation just completed by the Domestic Commerce Division of the Bureau of Foreign and Domestic Commerce.

Returns were received from 212 electrical appliance stores, representing stores of all sizes and all geographic sections of the country. The average loss was 1.5 per cent. Half of the stores showed losses of less than 0.2 per cent, but a number had losses of over 5 per cent. No estimate of loss due to repossession alone is available.

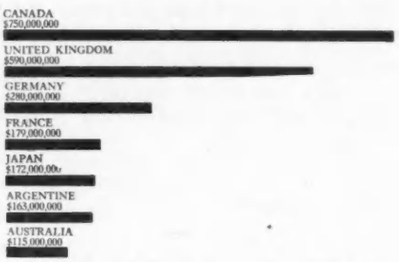
Radio Sales Increase

In volume of sales 1929 was "radio's biggest year," measured in both sets and dollars. Three million nine hundred thousand home receiving sets were sold in 1929, compared with 3,200,000 sets sold in 1928, or an increase of 22 per cent, according to careful estimates just completed.

In addition to the ordinary radio sets, 218,000 radio-phonograph combinations were sold in 1929, an increase of 150 per cent over the 81,000 sold in 1928. Radio sets and phonograph combinations sold in 1929 totaled a retail value of $549,848,000.

Our Seven Best Export Markets Listed

The Chamber of Commerce of the United States reports our seven best customer nations as measured by American export during the first nine months of 1929 to be Canada in first place, buying nearly $750,000,000 worth of American merchan-



dise; the United Kingdom in second place, with about $590,000,000; Germany in third, taking about $280,000,000; France, fourth with $179,000,000; Japan, fifth with $172,000,000; Argentine sixth, with $163,000,000; and Australia seventh with $115,000,000 worth of merchandise.

Iron and Steel Production Increases

The best evidence of the impressive come-back of business is in the iron and steel industry, where operations have

Orders for Electrical Goods

New orders booked during the fourth quarter of 1929, as reported to the Department of Commerce by 81 manufacturers of electrical goods, were $288,736,209, as compared with 338,169,678 for the third quarter of 1929 and $282,226,449 for the fourth quarter of 1928. Total bookings for 1929 amounted to $1,290,193,618, an increase of 25 per cent over the $1,029,721,508 of orders booked the previous year. The following totals of bookings for each quarter since the beginning of 1923 are presented, not as a complete statement of the industry but as probably sufficiently representative to indicate the trend in the buying of electrical goods.

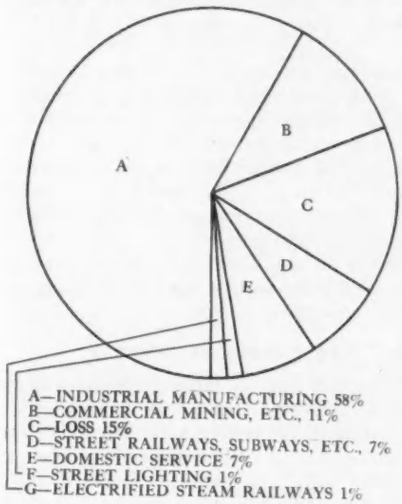
Orders for Electrical Goods

Quarter	1923	1924	1925	1926	1927	1928	1929
1st ...	$220,384,205	$221,687,030	$227,767,511	$255,917,883	$235,883,303	$237,508,001	$322,424,619
2nd ...	235,571,467	216,637,855	222,056,450	240,855,953	229,353,332	245,520,801	340,863,112
3rd ...	196,750,860	181,160,835	225,184,732	233,873,171	228,610,346	264,466,257	338,169,678
4th ...	210,994,546	225,070,111	237,225,521	251,442,991	232,877,670	282,226,449	288,736,209
Total .	863,701,078	844,555,831	912,234,214	982,089,998	926,724,651	1,029,721,508	1,290,193,618

stepped up from a December level of about 40 per cent of capacity to a 75 per cent rate at the end of January. The present level compares with an 84 per cent operating rate in January, last year. Prices tapered in January to the lowest point since November of 1927, but are expected to correct themselves shortly with a substantial volume of advanced bookings on hand and a sustained demand expected for the rest of the quarter. The broad spread of buying is the significant feature now.

Analysis of Uses of Electricity

The National Electric Light Association analyzing the percentage of electric power going to different types of uses, points out that 15 per cent on the average of the total power generated is lost in transmission without ever reaching the ultimate consumer. While electrical engineers have never been able to avoid this transmission loss, the Association points out what a great saving there would be could the loss be even materially reduced.



The complete analysis on the basis of 1927 figures showed that seven per cent of the energy generated went for domestic service; one per cent for street lighting; seven per cent for street railways, subways and inter-urbans; one per cent for electrified steam railways; 58 per cent for industrial manufacturing concerns and 11 per cent for commercial, mining and other uses, leaving 15 per cent unaccounted for, or the proportion lost between the generating station and the consumer.

Electric Power Costs Lower

Electric power costs to the public, including industrial, commercial and domestic uses, remain at pre-war levels despite the fact that living costs are 70 per cent above pre-war levels. Average price for household electricity throughout the nation is 28 per cent below pre-war levels, a drop of 3 per cent taking place during the past year, according to the National Electric Light Association. Based on the changed purchasing power of the dollar, household rates are only 42 per cent of those in 1913.

Advances in efficiencies of steam turbines and high-pressure boilers, following concentration of generation in large plants, have reduced the average consumption of coal from 3.2 lb. per kilowatt-hour in 1919 to 1.65 lb. in 1929. Lowered cost of electricity generated by fuels brings such power into increasingly sharp competition with waterpower, which forms but 3 per cent of all power generated by the electric light and power enterprise of this country.

Four Great Steam Turbines

During 1929 four great steam turbines were installed. Each has a greater capacity than the entire Muscle Shoals power house and is second in size only to the hydro-electric plants at Niagara Falls and Conowingo. These are located at State Line, Ind.; East River, N. Y.; Philo, Ohio, and Hell Gate, N. Y.

From an engineering standpoint, the principal developments of the year have been mainly in the improvement of steam-electric generation. Only 10 per cent of the present year's power house construction has been in hydro-electric plants, while, on the other hand, the concentration of production in large, high-pressure steam units has made remarkable progress.

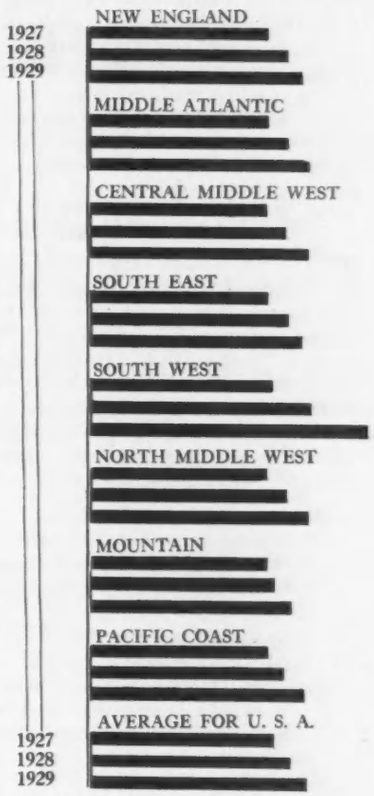
10,000 Miles of Lighted Airways in Operation

At the close of the fiscal year of the United States Government, the Assistant Secretary of Commerce for Aeronautics reported that there were 10,183 miles of lighted airways in operation in this country, with about 2000 more miles in the process of being equipped.

Included in the mileage now in operation were 263 intermediate landing fields, 1399 airway beacons, 164 airway weather reporting stations, 27 communication stations and 7 radio-range beacons

Increase in Output of Electricity

The preliminary figures of the demand for electric power during 1929 show a total increase in the production of electricity by all agencies which contribute to the public supply (plus imports from Canada) of 10.4 per cent, as compared with an increase of 9.3 per cent in 1928 over the year 1927. They reflect the intense industrial activity which characterized the greater part of the year, according to an analysis of the output of electrical energy made by the Statistical Research Department of the National Electric Light Association. Using the figures reported by the United States Geological Survey, grouped according to the various economic and electrically interconnected regions of the country, the growth in the use of electricity showed consistent gains in all sections except the Mountain States. Arranged in tabular form, these increases are compared with those registered in the previous year.



Increase in Output of Electricity

Region	1929 over 1928	1928 over 1927
New England	11.2%	8.6%
Middle Atlantic	10.7	8.0
Central Middle West	11.0	10.8
South East	10.1	6.9
South West	21.2	21.3
North Middle West	10.8	7.1
Mountain	1.6	11.4
Pacific Coast	10.1	10.3
Average for the U.S.A.	10.4%	9.3%

Five-Day Week Popular

According to the National Industrial Conference Board, there are at least 270 manufacturing establishments in the United States, employing approximately 218,000 persons, which are regularly operating on a five-day week basis.

Products of the Electrical Industry by Class for 1927 and 1925 According to the Biennial Census of Manufacturers for 1927

Class	1927	1925
Electrical machinery, apparatus, and supplies, total value	$1,551,816,138	$1,435,470,008
Batteries, battery parts, and supplies	150,216,485	155,247,811
Control apparatus	33,869,615	31,302,841
Electric fans	10,755,001	10,895,769
Generators, motor-generator sets, and automotive starter-motors	115,179,671	110,185,015
Household, heating, and cooking appliances	72,933,274	75,102,165
Industrial apparatus and appliances, not including motor-driven tools and devices	12,343,673	10,283,335
Interior conduits and fittings	42,105,294	46,329,735
Lamps (bulbs only), incandescent	87,933,204	73,558,210
Measuring instruments, relays, and instrument transformers	34,009,999	31,650,355
Motors (not including automotive starter-motors), motor parts, and supplies	122,146,337	113,109,577
Radio apparatus and tubes	191,228,647	178,834,697
Switchboards, circuit breakers, and switches	70,801,619	69,759,067
Telephone and telegraph apparatus	119,271,904	84,432,662
Transformers, induction voltage regulators, and current-limiting reactors	66,611,334	62,153,155
Wiring devices	32,216,698	34,806,452
Miscellaneous electrical machinery, apparatus, and supplies	390,193,383	347,819,162

"Megger" Instruments in Electrical Testing

(*Continued from page* 50)

grid-leaks, the hand generator of the instrument is omitted, for convenience, and an external source of direct current is used. The method has the distinct advantage that the applied potential does not have to be of an exact value in order to obtain an accurate reading; furthermore, short-circuiting the testing terminals does not injure the instrument or the source of current supply, even if the latter is a radio B battery.

In this work, however, more general use is now being made of motor-driven "Megger" testing sets, because they can be readily connected to a. c. or d. c. supply, are exceedingly rugged, and entirely transportable. Also the driving motor can be removed in just a few minutes allowing the "Megger" instrument to be operated by hand with its own source of testing current.

Uses of "Megger" Instruments

THE use of high-range "Megger" testing sets by telephone and telegram companies is a large and important application. Every mile of telephone "toll" cable installed by the American Telephone & Telegraph Company receives a "Megger" test after installation and before being placed in service. For nearly 20 years the "Megger" instrument has been an indispensable maintenance tool in telephone work where lead-covered cable is used.

There is an almost endless number of special uses for "Megger" instruments, for example, in the testing of:

Radio tubes in production.
Insulating varnishes and materials.
Telephone equipment in development and production.
Moisture content of various materials such as wood, grain, etc.
Electrical fittings for quality of material, for leakage, and for susceptibility to moisture.
Ceramic materials used as insulators for heating units. (It is well known that such materials become relatively good conductors of electricity when heated to sufficient temperature.)

The rapidly increasing use of the vacuum tube in industrial applications—from sorting beans to the automatic control of modern steam railway trains—calls for better insulation in every part of the circuit. With a small current flowing, a small leak has a greater effect, and no matter how good the dielectric strength, if the insulation resistance is low, the apparatus will not function properly.

The time has passed when the test lamp, the bell-ringing magneto and even the high resistance voltmeter arranged for testing insulation resistance, will give a reliable and satisfactory answer. New electrical developments are demanding better insulation than that which would "get by" a few years ago, and it is being realized that if older equipment is to function with greatest economy, the insulation is a vital part which bears watching carefully. Although the "Megger" instrument in principle of design and construction is now over 20 years old, it appears to meet every present-day demand for quick accurate tests of insulation resistance within its range.

It might be well to summarize various methods for testing insulation resistance leading up to the "Megger" method and to describe the principle of operation of the latter.

1—*Test Lamp*—An ordinary 50-watt lamp gives an indication of insulation resistance up to about 1000 ohms.

2—*Bell-ringing Magnetos*—These are designed to ring through 10,000, 25,000 and sometimes 50,000 ohms. Aside from this limited range, they have the great disadvantage that they will frequently ring owing to electrostatic capacity in the apparatus under test, although the insulation may be perfectly good. This is because the magneto generates alternating current which "flows through" the electrostatic capacity.

3—*The Voltmeter Method*—By the use of an ordinary voltmeter insulation resistance can be calculated from the formula $\frac{E-e}{e} R$ = Insulation Resistance in Ohms,

where E = line voltage, or voltage used for the test,
e = volts leak, or volts to ground,
R = the total resistance in ohms of the voltmeter used.

Two voltmeter readings are necessary—E and e, with a repeat reading of E for a check. A steady d. c. potential must be used, and, if serious errors are to be avoided, it must be highly insulated from ground on account of possible parallel leaks. A calculation must be made for each reading. It is not safe to give the result in terms of "volts to ground," because voltmeters having different resistances will give very different results. The range is limited to the resistance of the voltmeter and the value of the applied voltage, and even with a very high resistance voltmeter will not be very accurate above ten megohms.

"Meggers" Are Simple to Operate

THE "Megger" method has so largely replaced other methods for practical tests of insulation resistance that further comparison probably is unnecessary. In using the "Megger" method, one has a self-contained source of direct-current potential, which is entirely insulated from the apparatus under test. Direct current means that there will be no trouble on account of electrostatic capacity effects, and the insulated source of potential means there will be no parallel leaks to affect the result, and any part or all of a wiring installation or piece of equipment can be tested. Furthermore, the result is shown directly by a pointer on a scale, and its accuracy is not even dependent upon the exact speed of turning the crank of the hand generator, because the instrument is a true ohmmeter.

As has been stated, an understanding of the "Megger" principle is not at all necessary for its proper use. It consists, however, of two coils mounted rigidly on a moving system. One coil is called the current coil and is in series with the apparatus under test. The current through this coil depends on the unknown resistance X. The other coil is the voltage or potential coil which receives voltage from the generator when the hand crank is turned. The two coils tend to make the pointer move in opposite directions—*i.e.*, to zero when the test terminals are short-circuited, and to infinity when the test terminals are left open. An unknown resistance X will therefore cause the pointer to be acted upon by two forces working in opposite directions, and the pointer will come to rest in a position where these two forces balance each other. The corresponding point on the scale indicates the value of the resistance X. Any change in the speed of the generator—and hence the voltage—affects both coils in the same proportion and therefore the reading remains the same—irrespective of the exact speed. This is very important in making the instrument simple to operate and read, and is why the instrument is called a true ohmmeter.

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The publication of this, the first of the Fact-Sheets of Industry, is the start of a plan which, when at its full growth, will supply freely to thinking workers in ALL levels of industry, practical knowledge which hitherto has not been readily accessible; facts from many other industries which may stimulate their own productive thinking; and which (though they affect practically every business, every department and every worker), are usually known only in part and only by a limited group of specialists in each industry. . . .

As a movement in line with national measures for further improvement of business conditions and of the circuit of producing, earning, consuming, equipping, etc.—and as the initial step in this democratizing of inter-industry knowledge, (which, under present conditions, is more needed by thinking workers, and can yield more important results than ever before)—all expenses of issuing the first of the Fact-Sheets of Industry are being borne by The National Vulcanized Fibre Company and its various divisions and associated industries.

NATIONAL VULCANIZED FIBRE COMPANY

A Copper-Alloy Without Tin Having Unique Properties

The new metal is a substitute for tin-bearing bronzes and gun-metal that is easily cast or forged, is ductile and can be extruded, making it particularly adaptable for many applications in the electrical industry

OF PARTICULAR significance to electrical manufacturers who are users of copper-alloy metals and various kinds of bronze is the announcement of a new copper-alloy, made without the use of tin, that has been recently introduced into this country. It was developed in the Vickers-Armstrongs, Ltd., Naval Construction Works, Barrow-in-Furness, England, and all sales rights in the United States are controlled by Driver-Harris Company, Harrison, N. J.

According to Dr. M. A. Hunter, consulting research engineer for the Driver-Harris Company, P-M-G metal, as the new product is to be known, is superior to gun-metal in strength and other mechanical properties at normal and elevated temperatures. It consists of 88 per cent copper, 2 per cent zinc and 10 per cent of P-M-G hardener, which is the matter of the invention, and which replaces the usual 10 per cent tin in gun-metal and varying percentages of tin in other bronzes.

Hardening Properties Due to Use of Iron and Silicon

The alloy as cast contains as its major components 2 per cent of iron and 3.4 per cent of silicon with 2 per cent zinc. The hardening is presumably due to the presence of iron silicide. This compound dissolves at high temperatures in the molten copper. On cooling, the iron silicide precipitates from the solid solution in such manner as to increase the hardness of the solidified alloy. The properties of the metal, as in similar cases of precipitation hardening, can be modified by heat treatment consisting in quenching with or without reheating.

It is further stated that P-M-G hardener is inexpensive to manufacture and that because of the quality of castings, there are fewer foundry rejections. The elimination of foundry wastes and labor losses is a decided advantage for the new metal.

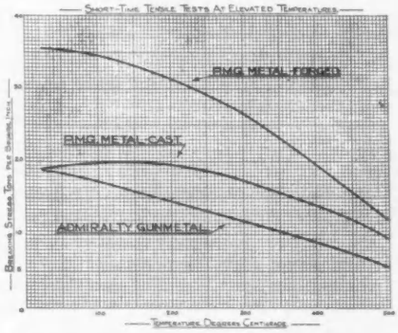
In some forms of alloys, where the hardener is used, zinc may be omitted, and in other cases the hardener may be used in any proportion, according to the degree of hardness required in the casting, as it has been varied from 1 to 18 per cent with good results.

Foundry practice in the production of this new alloy is identical with that for the making of gun-metal and other bronzes. The castings are similar in color to bronze. They have a uniform grain size, are uniform in composition and density in varying dimensioned sections, and in such castings the characteristic defects associated with bronze castings, such as sand-holes, are almost entirely eliminated.

A Copper-Alloy That Can Be Forged Either Hot or Cold

P-M-G metal can be extruded into bars of varying diameters without lamination or defect. In one test two bars 1¼ and 1 in. in diameter, respectively, were extruded from a cast bar of the material and the mechanical results were highly satisfactory. With the 1¼ in. bar the yield point was 30.4 long tons per sq. in.; ultimate tensile strength, 40.8 long tons per sq. in., and an elongation of 22 per cent in 2 in. The 1-in. bar gave the following results: yield point, 26.0 long tons per sq. in.; ultimate tensile strength, 39.2 long tons per sq. in., and an elongation of 24 per cent in 2 in.

Forging properties of the metal are best explained from reference to the results of some tests in which a 3-in. cast round billet was heated to redness and forged under a hammer to a 1-in. square section. The bar was allowed to cool further, and the other end was forged at a black heat to 0.88 in. in square cross section. During these tests the metal was hard and a large number of hammer blows was required, but no cracking occurred. The bars forged at red heat gave a yield point in one case of 56,500 lb. per sq. in., and in another, 45,900 lb. per sq. in. Their ultimate tensile strength was 77,950 and 76,200 lb. per sq. in., respectively, while in one case the elongation was 34 per cent in 2 in. and 42 per cent in 2 in. in the other. In both cases the cup fractures were silky.



A comparison of the tensile strength of cast and forged P-M-G metal with that of admiralty gun-metal

In the case of the bar forged at black heat the results gave a yield point of 82,650 lb. per sq. in., an ultimate tensile strength of 94,000 lb. per sq. in., and an elongation of 17 per cent in 2 in., while, as in the other tests, the cup fractures were again silky in appearance. In all cases variations in the results were due to differences in temperatures. The properties of the bar hammered at black heat, however, showed that the metal does not become brittle even when the finishing temperature is very low.

Brinell Tests Show Density of the New Copper-Alloy Metal

Brinell tests of the forged bars and sand castings gave the following results, using a 3000-kg., 10-mm. ball:

Condition of Material	Brinell	
Sand cast	104-109	107-121
Forged	126	143
Forged (Finished Cold)	153	149

The density of cast specimens was found to be 8.45, and on material hot-forged from 3-in. to 1-in. square was 8.44. This agreement should indicate that the material is quite sound.

Other tests indicate that P-M-G metal compares very favorably with gun-metal and different types of bronzes with respect to high temperature service, erosion, salt water action, bending, stud-holding, antifriction and sweating.

Aside from the foregoing properties this new copper-alloy metal is easily machined and the equipment and tools required are much the same as those employed for other types of bronze or gun-metal. In addition the metal has a very short freezing range which approximates 950 deg. C. to 900 deg. C. and in the wrought condition it possesses greatly increased strength with ample ductility. The metal also lends itself to drop forging, flowing readily filling the die and giving a very sharp and satisfactory result.

According to its manufacturers, it can be used as a substitute with considerable saving for any type of bronze or gun-metal, and is particularly applicable for electrical uses in that its specific resistance is 210 ohms per circular mil-foot, with a temperature coefficient equal to one-tenth that of copper.

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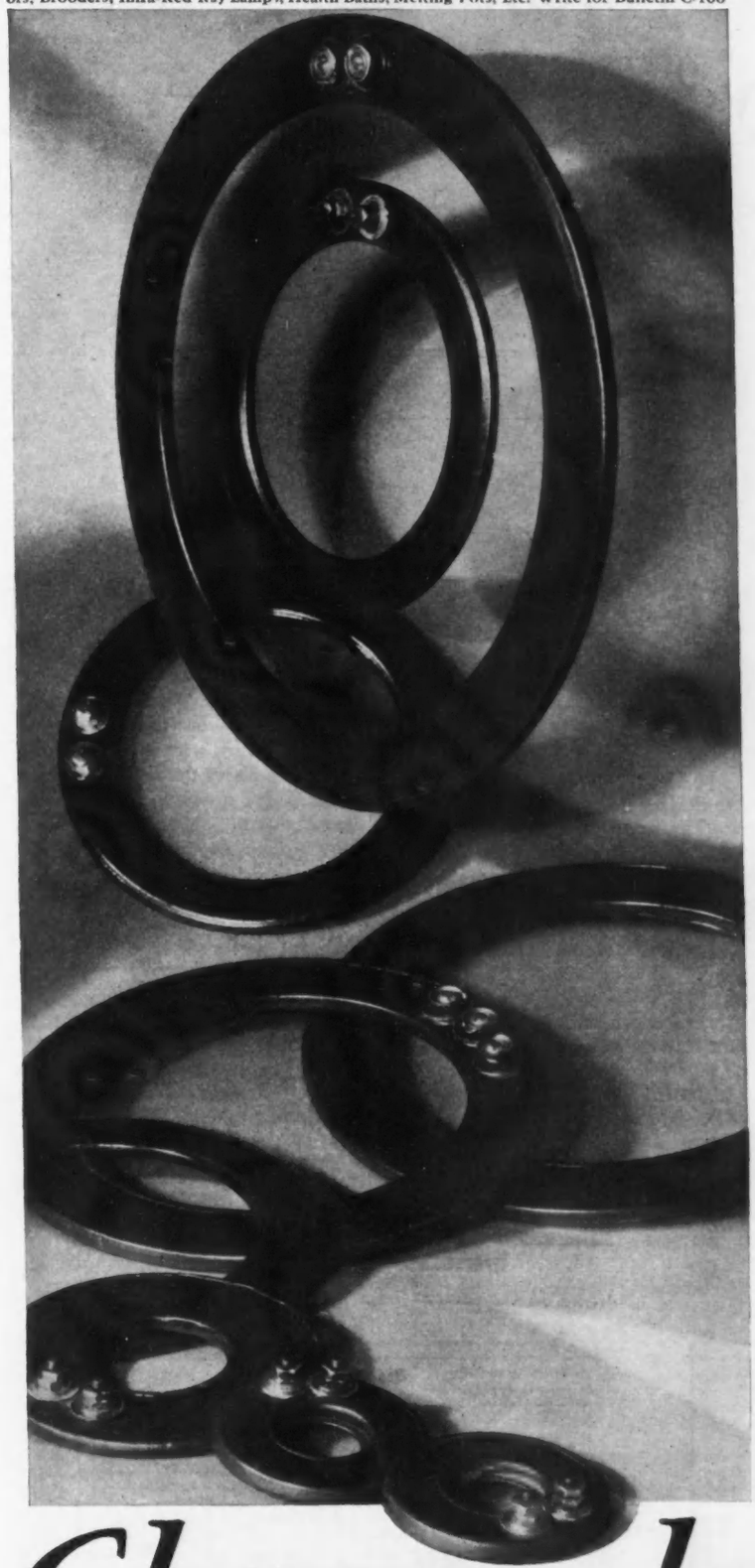

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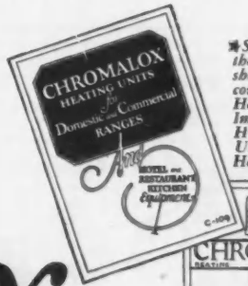

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What Wage Payment Plan Is Best for Employer and Employee?

The discussion of wage systems in the accompanying article is timely in that the wage question is of particular significance in industry today

By J. J. BERLINER

THE problem of wage payment occupies a position of central interest in the industrial world. "How much do you pay?" "What is a fair day's wage?" These two questions are immediately put by workers on the one side and employers on the other. The question of wages presents one of the most difficult problems to be solved by industry today.

The methods which have been devised for remunerating labor may be classified into three groups as follows:

1—Time work, in which the employee is paid by the hour, the week, the month, or the year.

2—Contract work which includes different payment plans such as (a) the ordinary piece-rate method, (b) the differential piece-rate method, (c) the collective contract, whereby a contractor agrees to furnish the labor for a certain quantity of product at a certain price, the contractor selecting his own method of paying those who work for him.

3—Bonus, efficiency, or premium systems, including (a) promotion systems under day rate as a reward for increased efficiency, (b) the Halsey premium system, (c) the Rowan premium system, (d) the bonus system, (e) the efficiency system, (f) combinations of the above.

Time Work—With time work in its usual form, there is no record of the individual's performance. There is no incentive for effort except of such a sort as will result in the employee's recognition as a good worker by his superior and as such increase his chance for promotion. On the other hand there is really no penalty for ordinary inefficiency or time-killing. As soon as a reward is introduced for individual efficiency, a departure is made from the traditional time work or day rate, even though the reward may be of a sort which is not recognized among the so-called bonus or premium systems of pay.

As regards time work; one of the surest ways of cutting down on the waste of materials and labor is by the introduction of time and motion studies. By time and motion studies, plus standardized routing, scheduling, moving of materials, and functional foremanship, many economies will ensue. But it must be noted that unless the proper inducements are offered to employees for the extra effort necessary to follow the various instructions, together with penalties attached for failure to put forth such efforts, only a fractional part of the advantages of standardization and planning will be realized. Proper supervision as well as standardization and planning, and good working conditions, such as are developed by proper welfare activities, will go a great way toward remedying time losses under a day-rate system. In fact, these conditions are necessary in the introduction of any kind of wage system.

Ordinary Piece Rate—Piece rate system is the plan of paying for measurable results rather than for time service. At first thought, ordinary piece rate would seem mathematically fair. The system, however, has been so badly abused that there exists at present, a tremendous prejudice against it.

Piece rate has been used as a bait to speed up employees to a certain pace and then, when the pace was reached at which certain workers would earn more than the management considered they were worth the rate was cut. After several such cuts the system produced nothing but fear and hostility together with intentional loafing on all new work, so as to get the piece rate set as high as possible, since it was bound to be cut. If piece rate is to be used at all, it must be accompanied by a guarantee that there will be no change in rate so long as methods, tools and machines are not changed.

However, where time reduction results through improved machinery and is in no way the result of effort on the part

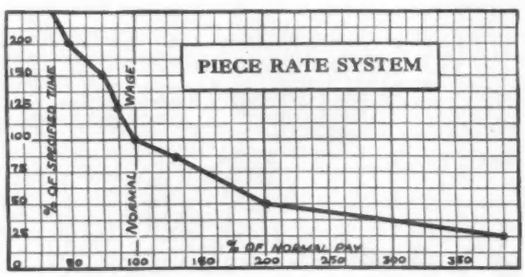

Chart 1
A diagram showing how normal pay increases and decreases under the ordinary piece rate of wage payment

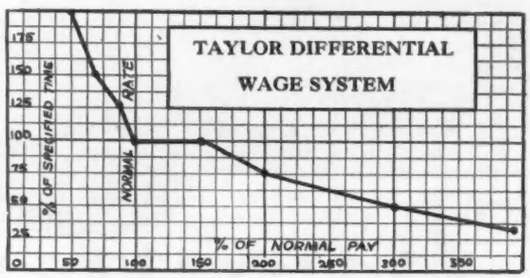

Chart 2
Under the differential piece rate the pay per piece increases at a more rapid rate as time is reduced

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of the employee, a change in rate does not constitute a cut. Chart 1 shows how normal pay increases and decreases under ordinary piece rate.

Differential Piece Rate—The differential piece rate consists of two rates: (1) the ordinary piece rate, which is paid a man for a normal or ordinary output, and (2) a higher rate, which is paid per piece, if a man turns out more than an ordinary output. Under the differential piece-rate system the workman not only has nothing to fear of

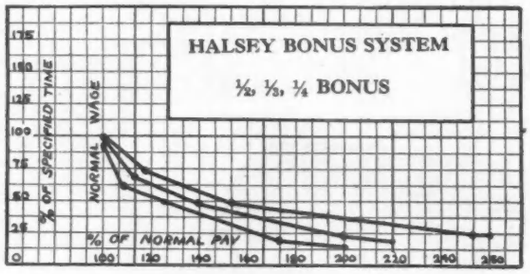

Chart 3

Under the Halsey premium system the workman receives his hourly rate and extra pay when he does work in less than standard time

the rate being cut, but he has a tremendous incentive to earn high pay, in view of the fact that he receives an exceptionally high reward for accomplishing good results.

For example, assume that, as the result of time study, it is shown that a piece of work can be done in 15 minutes. In order to allow for necessary rest periods and avoid lost time, 60 per cent is added to the possible time, an increase of 9 minutes as an incentive, making 24 minutes the normal or average man's time. In an eight hour day we should have 480 minutes; hence, the normal average output of an ordinary man would be 20 such pieces. Under the differential piece-rate system there would now be two rates offered, say, for example, 30 cents per piece for an output of 20 or less, and 32 cents per piece for an output of more than 20. Thus if the man produces 20 pieces, his earnings for the day would be $6, whereas if he turns out 22 pieces, his earnings rise to $7.04. The company can afford to offer the increased piece price because the cost of operating a machine tool, including power, light, heat, rental, repairs, etc., is likely to be as great as the rate of the man who is operating the machine, and the day rate of the machine remains very nearly stationary, while the

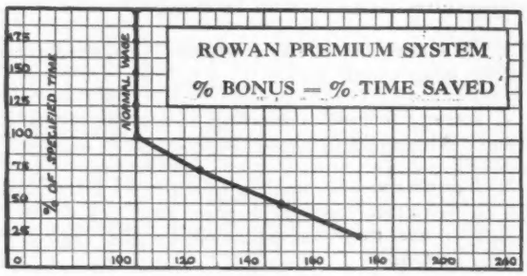

Chart 4

Another system of wage payment is known as the Rowan premium system. It is similar in many respects to the Halsey plan

output increases. Chart 2 shows how, under the differential piece rate the pay per piece increases at a more rapid rate as time is reduced than under ordinary piece-rate.

This last point may be illustrated mathematically. Let us assume that the cost of operating is 40 cents an hour. The formula for determining the direct labor and machine cost per piece will be as follows:

Machine rate × hours × piece rate × number of pieces = cost per number of pieces

Thus if a workman turns out only 16 pieces during an eight hour day, the cost per piece then will be:

$$\frac{35 \times 8 \times 30 \times 16}{16} = \frac{760}{16} = 47\frac{1}{2}\text{c.}$$

If, on the other hand, a good workman turns out 22 pieces, the cost per piece will be as follows:

$$\frac{35 \times 8 \times 32 \times 22}{22} = \frac{984}{22} = 44.3\text{c.}$$

From these illustrations it is seen that the workman who produces only 16 pieces earns $6 per day and the cost to the employer is 47.5 cents per piece. On the other hand, the workman who produces 22 pieces earns $7.04 per day, while the cost to the employer is only 44.3 cents. This illustrates the fact that under a properly adjusted wage system of the differential piece system, both employer and employee may profit.

Contract Work—Where work is repeated over and over again in considerable volume, the practice exists of making a contract with competent workmen whereby they are to furnish a certain number of pieces at a specified price. Under this arrangement the contractor employs his own men, while the company furnishes the material, buildings, equipment, tools, etc. Perhaps the most satisfactory reason for the employment of contract work seems to be that organized labor will submit to a brisk pace when imposed

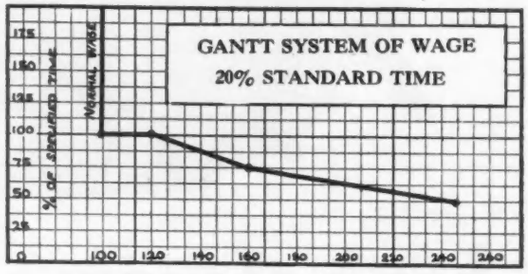

Chart 5

With the Gantt bonus system time standards are established and the employee is guaranteed a certain hourly rate regardless of his efficiency

upon its members by a contractor who is himself a member of the organization.

Halsey Premium System—In the premium system devised by F. A. Halsey, the workman receives his hourly rate, and in addition to this receives extra pay every time he does the work in less time than the standard time. The time standard originally used by Mr. Halsey was the average of the records of previous performance. At the present time, however, the time standard is usually taken from 40 to 60 per cent higher than the time in which a skilled workman can do the work under correct conditions, such time standards having been established by a scientific motion and time study made during demonstrations by a skilled mechanic. The method of figuring wages under the Halsey premium plan is expressed in the following equation (see also, Chart 3):

Wages equals the time taken and the hourly rate × the time saved × a fraction of the hourly rate.

The usual fraction of the hourly rate is 50 per cent, prior to the general acceptance and introduction of accurate motion and time study made on demonstration by skilled workmen as a basis of time standards. Various systems were used which sought to establish a diminishing premium scale as the time was reduced below the time standard. These systems sought to provide a sort of insurance for employers who made mistakes in setting their time standards too high.

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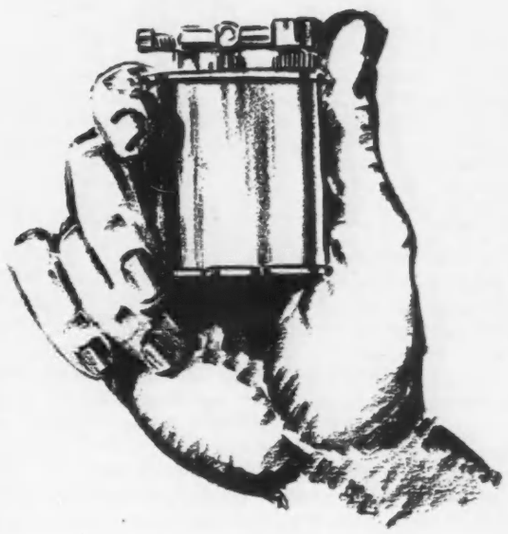

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The increasing list of those we are privileged to serve is a fair way to gauge the value of our cooperation.

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The following table shows some of the results actually obtained under the Halsey Premium Plan:

Time Allowed	Time Taken	Wages on job at 30c. per hour	Premium, ⅓ of the value of the time saved	Workman's earnings per hour	Total labor cost of job
10 hours	10 hours	$3.00	$0.00	$0.300	$3.00
10 hours	9 hours	2.70	0.10	0.311	2.80
10 hours	8 hours	2.40	0.20	0.325	2.60
10 hours	7 hours	2.10	0.30	0.343	2.40
10 hours	6 hours	1.80	0.40	0.366	2.20
10 hours	5 hours	1.50	0.50	0.400	2.00

The premium rate has the advantage that it does not set up fear as an incentive. Absolute guarantee should be made of the principles of time standards under the premium rate system, so long as methods, tools and machines are not changed.

Rowan Premium System—This is a modification of Halsey's premium system devised by James Rowan. Time limits are established as under the Halsey system. The amount to be added, in case the time limit is reduced, is figured as follows: The premium equals the money value of the time actually taken to do the job multiplied by the time saved and divided by the time limit. For example, if the time limit is 10 hours for a piece of work on which s employed a man receiving 30 cents an hour, for his regular time; the premium to be added will be $\frac{2 \times 2 \times 40}{10}$ or 48 cents.

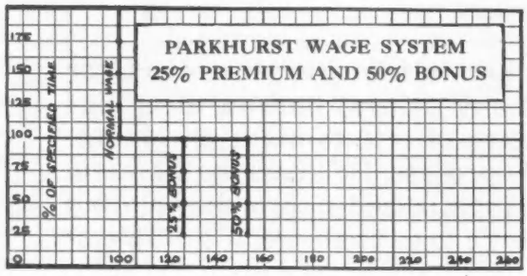


Chart 6

A diagram showing how pay on individual-job bonus system increases as the time is reduced under the Parkhurst wage system

Further results of the application of the Rowan Premium System are shown in the following table (see also Chart 4):

Time Allowed	Time Taken	Wages on job at 30c. per hour	Premium money value X% of time saved	Workman's earnings per hour	Total labor cost of job
10 hours	10 hours	$3.00	$0.00	$0.30	$3.00
10 hours	9 hours	2.70	0.27	0.33	2.97
10 hours	8 hours	2.40	0.48	0.36	2.88
10 hours	7 hours	2.10	0.63	0.39	2.73
10 hours	6 hours	1.80	0.72	0.42	2.52
10 hours	5 hours	1.50	0.75	0.45	2.25

Under this system, no matter how far the time is reduced, the premium will never be quite as great as the regular pay at a given time, so that the workman can never double his wages. Some of the objections raised against this system are that it requires a higher grade of clerical help to figure out the premium than is needed with the Halsey system, also that figuring the premium is too complicated an affair for the workman, and that he will therefore become dissatisfied. Where the clerical labor and workmen are both of a high order of intelligence, these last objections will not hold good. Another objection made is on the ground that there ought to be no limit to the amount of premium or bonus which a man can earn. In reply to this, the statement is made that the management may have a very definite idea of the shortest time in which it is desirable to do a piece of work from considerations of accuracy, wear of machinery and fatigue affecting the man.

Cantt Bonus System—In this system time standards are established, but the employee is guaranteed a certain hourly rate regardless of his efficiency. If he does the work in the standard time he receives a bonus usually from 20 per cent to 50 per cent, depending on the nature of the work (see Chart 5).

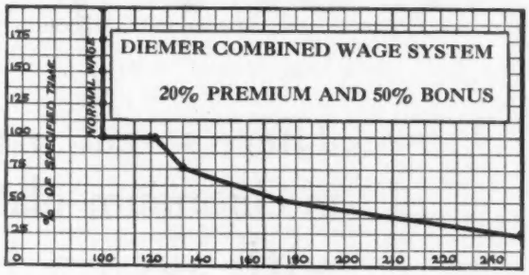


Chart 7

The Diener bonus and premium provides that workmen be paid a percentage of their wages if they reduce production time below past averages

If he does the work in less than the standard time he receives the time rate for the standard time plus the same bonus. In other words, the system is virtually a time rate for the man who does the work in more than standard time, and it is a piece rate for those who reach or better the standard.

Suppose, for example, that the standard time for a given job is eight hours, the rate of pay is 40 cents per hour, and the bonus is 30 per cent. If the man takes ten hours to do the work he gets 10 times 40 cents, or $4 for the job.

If he does the work in eight hours, he gets eight times 40 cents, or $3.20 plus 30 per cent on 8 hours—which is 96 cents, thus making his earnings $4.16 for eight hours, and his hourly rate 52 cents. If it takes him six hours to do the work, he receives $2.40 for the time at work, plus 96 cents as a bonus, making his total wage $3.36 and his hourly wage 56 cents as contrasted to 40 cents in the first instance and 52 cents in the second.

The purpose of this system is to secure to the workman his earnings while he is learning the job, and then pay him a sufficiently large bonus to keep him working at his highest rate of efficiency.

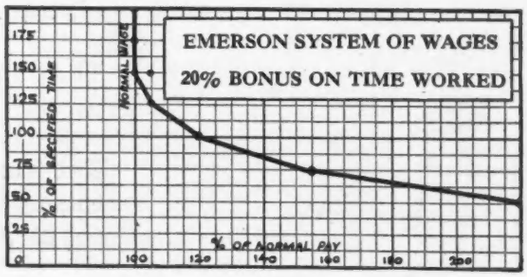


Chart 8

The Emerson system of wage payment provides for a percentage bonus on the time worked. A sliding scale determines the amount of bonus

In addition to the bonus paid the workman, a bonus is also frequently paid to the foreman. The foreman's bonus varies with the number of workmen in his gang who earn their bonus: i.e., it is larger if all the men in the gang succeed in earning their bonus than if only some of them are successful.

For instance, assuming that the foreman had 10 men

YOUR MANUFACTURING AND SALES SERVANT

Sweeping aside obstacles in both manufacturing and selling, the light, strong Alloys of Alcoa Aluminum do double duty for you.

Because they weigh only ⅓ as much as old-fashioned metals, they speed up and simplify every handling operation. Pressed products of Alcoa Aluminum are easily fabricated, have high over-all strength, and no thin or weak spots. Forgings of Alcoa Aluminum combine maximum strength with maximum lightness. All parts made of Alcoa Aluminum take a high polish, and are cheaper and easier to machine.

And every month millions of housewives are becoming better acquainted with the advantages of Alcoa Aluminum. The Saturday Evening Post, Good Housekeeping and Country Gentleman carry the story of Alcoa Aluminum, and its use in household appliances, into the homes of your prospective customers. This advertising is helping to sell your products if they are made of Alcoa Aluminum, for it is making that most critical buyer, the American housewife, thoroughly aware that the light, strong Alloys of Alcoa Aluminum conduct heat 5 times faster than iron or steel—that they *cannot* rust—that they are extremely durable. Such knowledge is bound to influence her choice of labor saving appliances.

Without obligation, a representative from our nearest office will gladly discuss the use of Alcoa Aluminum in your products. He will show you how this modern metal will help you in manufacturing and selling. ALUMINUM COMPANY *of* AMERICA; 2444 Oliver Bldg., PITTSBURGH, PA.

ALCOA ALUMINUM

under him, he would get 10 cents per bonusman, or $1 per day, if nine of his men made their bonus. If, however, all his men made their bonus, he would receive 15 cents per man, or $1.50. This system applies the differential piece rate for rewarding the foreman. There is an inducement for him to secure the highest efficiency from every workman.

It will be noted that the individual job bonus system recognizes 100 per cent efficiency on the individual job, but does not reward a man for his effort, in case he does not attain 100 per cent efficiency. The payment of bonus on individual jobs demands a high grade of accuracy and integrity on the part of the person keeping the time record, so as to prevent the robbing of time from one job and putting it on another in order to favor the working man. Moreover, the most desirable employee is not the one who makes gains by occasional spurts, but one who averages high in efficiency. Under the individual-job bonus system there is no incentive to maintain a uniformly high efficiency on all jobs. Chart 6 shows how pay on individual-job bonus system increases as time is reduced (Parkhurst Wage System).

DIEMER Bonus & Premium System.—Under this system, workmen are paid a percentage increase of their wages, such as 10 per cent, etc., if they reduce below past average the time in which the work is done. They are paid 20 per cent of hourly wage increase if the work is done in a specified standard time, such standard time being based on motion and time study, or demonstration by skilled workman, and about 30 per cent being added to this time. A further so-called "gain-sharing bonus" on the Halsey premium plan was allowed if they did the work in less than the specified standard time. In addition to the bonus wages paid, a record was kept of every man's percentage of success during each pay period, and each man's percentage of success was made the basis of promotion in his hourly rate (see Chart 7).

Efficiency System—Under this system a standard time is established for each job. During each pay period a record is made of the number of hours a man worked on the jobs on which time standards were established. Then the total hours in which he did these standard time jobs is divided into the total sum of the time standards. For example, if the sum of the standard times in a given pay period totals 210 hours, and the man took 240 hours on these jobs, then his efficiency would be $\frac{210}{240}$ or 87.5 per cent.

H. Emerson devised a sliding-scale for determining the bonus to be paid under the efficiency system. This scale is as follows:

Per Cent Efficiency	Bonus as Fraction of Wages
66	0.0001
68	0.0004
70	0.0020
72	0.0055
74	0.0101
76	0.0161
78	0.0239
80	0.0330
82	0.0435
84	0.0555
86	0.0693
88	0.0840
90	0.1000

Above 90 per cent efficiency add the percentage above 90 to 10 per cent and the sum is the fraction of the wages to be paid as bonus. Chart 8 shows how, with guaranteed day rate, the Emerson system rewards for increased efficiency.

Selecting a Wage System—In conclusion, it must be noted that the type of wage system to be introduced will depend not only on the extent of standardization, but also on whether the workmen are of a high or low grade of intelligence, and whether or not they are under the domination of strict union regulations in regard to wages. In general, we may state the field of the systems as follows:

Where standardization has not been developed very far, time work with efficiency records is appropriate.

Where standardization is under way, but has not been very well developed, the premium system is applicable.

Where standardization is fully developed, the bonus system on individual jobs, the combined bonus and premium system, or the efficiency system can be used.

Intelligent Motor Selection

(*Continued from page* 41)

the job, but, in fact, it is his obligation to his public, for the sake of the industry, that he do so.

It is distinctly bad for the motor buyer to insist upon purchasing the wrong motor for the job. If the machinery manufacturer is able to get a motor for his apparatus which is not the best from an engineering standpoint, he will be the first one to complain as soon as its unsatisfactory operation out in service has given him any considerable amount of trouble. Likewise, he will try to absolve himself of any responsibility in the matter and make the motor manufacturer the goat by expecting him to bear the financial responsibilities for failures, replacements and servicing.

The best thing that a motor manufacturer can do in such a case is to refuse to sell a particular type of motor that is likely to give trouble. The point should be stressed that all conditions of the service to which the motor would be subjected should be in the hands of the motor manufacturer in the first place, in order to allow of proper recommendations being made. Unfortunately motor buyers often view attempts to get details of the machine design or test data on it, with suspicion.

THE only contact between a machinery manufacturer and a motor manufacturer that is worth while is one that results in the establishment of profitable business relations. This necessarily calls for confidence on the part of the customer in the character of the motor manufacturer with whom he deals.

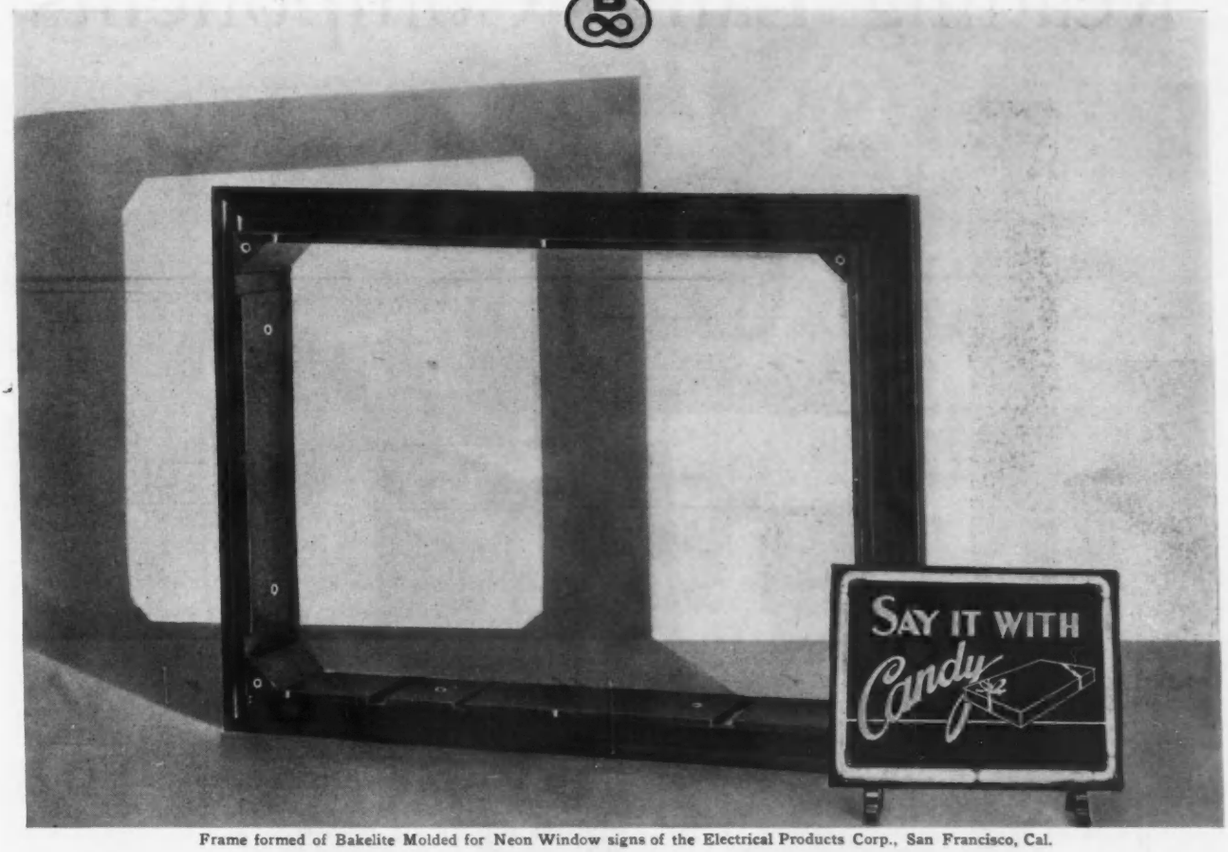
It goes further than the question of confidence in the ability of the motor manufacturer to produce well made goods that he is responsible for under the terms of his guarantee.

In the engineering of new applications, in order that some of the unfortunate consequences of using the wrong motor may be obviated, it is necessary that the machinery manufacturer trust the motor manufacturer even to the extent of revealing to him the details of new machines that he may be perfecting, even though not covered by patents.

No responsible motor manufacturer would lay himself open to suit in such a case by appropriating any secrets of design revealed to him, the origin for which could usually be proved without much difficulty. On the other hand, his entire business good will rests largely on protecting his customer's confidence in him, by keeping information relative to new designs to himself, and not allowing other machinery manufacturers, no matter what their status, to know anything of it.

Most motor manufacturers recognize that the best type of business to get involves new applications, rather than taking business from competitors on an old application, and it is for this reason that the motor manufacturer must fulfill his trust.

The backbone of modern business is confidence.



Frame formed of Bakelite Molded for Neon Window signs of the Electrical Products Corp., San Francisco, Cal.

A jointless frame 16″ long, 12″ high, 2¾″ deep completed in one press operation

AN excellent example of the advantages of Bakelite Molded for producing a large shape in one seamless piece, is provided by the deep frame for Neon window signs. This frame is strong, rigid, exact in dimension and free from seams or joints. The recesses and grooves for wiring are formed, and the metal inserts for assembling the lighting devices firmly embedded and accurately positioned in the molding operation.

Because of the high insulation value of Bakelite Molded, it is especially suited for mounting electrical devices of various kinds. The permanently rich lustre and attractive color of the material adds greatly to the pleasing appearance of devices and parts, and often increases their salability. We invite you to write for a copy of Booklet 52-M, "Bakelite Molded," illustrating a wide variety of applications of this material.

Bakelite Engineering Service. Intimate knowledge of thousands of varied applications of Bakelite Materials combined with twenty years' experience in development of phenol resinoids for electrical uses provides a valuable background for cooperation offered by our engineers and research laboratories.

BAKELITE CORPORATION

247 Park Ave., New York, N. Y. Chicago Office: 635 W. 22nd St.

BAKELITE CORPORATION OF CANADA, LTD. 163 Dufferin Street, Toronto, Ont.

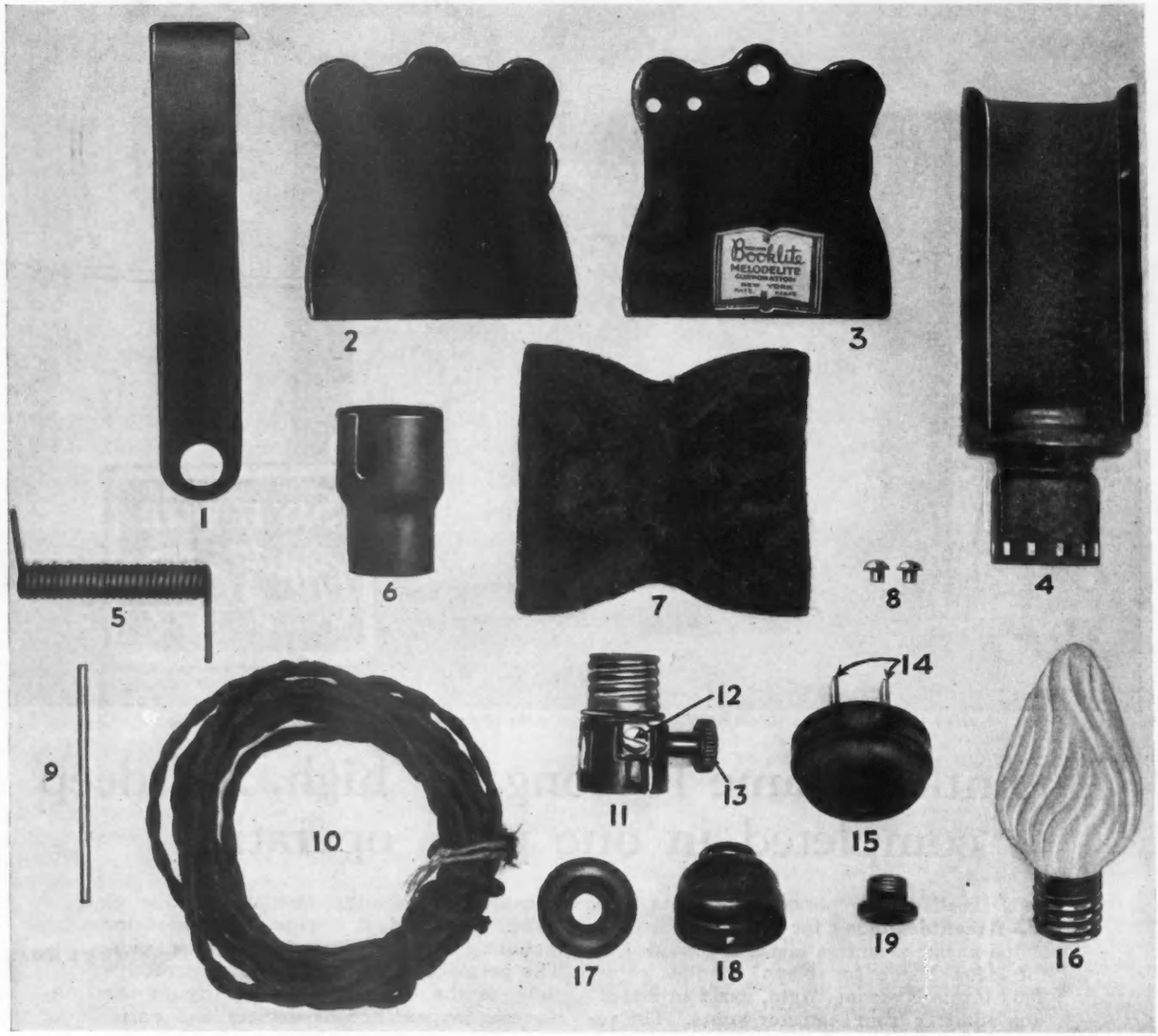
BAKELITE

REGISTERED U. S. PAT. OFF.

THE MATERIAL OF A THOUSAND USES

"The registered Trade Mark and Symbol shown above may be used only on products made from materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity It symbolizes the infinite number of present and future uses of Bakelite Corporation's products."

Reading Lamp Components



ELECTRICAL MANUFACTURING *acknowledges the assistance of the Melodelite Corporation, 130 West 42nd Street, New York City, in the preparation of the illustration shown above and the following table of reading lamp or book light components. This is typical of the types of this device being manufactured today and shows the various kinds and classes of materials employed in the construction of these miniature lights. This consists in the main of such materials as aluminum, copper, brass and insulation*

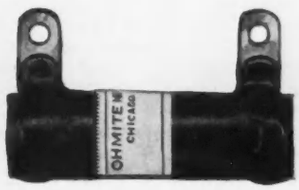
Although comparatively small in size and made up of a minimum number of parts, these small reading lamps utilize many different kinds of raw electrical materials in their construction, these being chiefly copper, insulation and aluminum.

Table of Parts and Raw Materials Used in Reading Lamp Construction

Part No.	Title	Material
1	Bracket	Aluminum
2	Clamp plate	Aluminum
3	Clamp plate	Aluminum
4	Shade	Aluminum
5	Clamp spring	Brass
6	Socket insulation	Fibre
7	Clamp pad	Felt
8	Rivet	Aluminum
9	Pin	Steel
10	Connecting cord	Copper, silk and cord
11	Socket	Molded insulation
12	Contact and screw	Brass
13	Handle	Molded insulation
14	Attachment cap contacts	Brass
15	Attachment cap	Molded insulation
16	Lamp	Glass, brass insulation and filament
17	Socket insulation	Fibre
18	Socket cap	Brass
19	Cord ferrule	Brass

Here's a resistor that

LAUGHS *at heat!*



Heat Resistance Units

Up to 250,000 ohms on units only 4 in. in length

Up to 100,000 ohms on units 2 in. in length

The 4 in. size will dissipate 10 watts and the 2 in. size will dissipate 5 watts at these high resistances.

Single Layer Wound Vitreous Enameled

This new Reference Catalog should be in every electrical engineers' library. Sent promptly on request.

BECAUSE its Vitreous Enamel coating, which completely encases the wire and terminals with a glassy hard protection, quickly dissipates the heat from the wire to the outside air.

BECAUSE the special Ohmite vitreous enamel is so applied that the wire permanently retains its even spacing just as it was wound.

BECAUSE, due to this even winding, the heat is uniformly distributed throughout the unit, allowing no hot spots.

BECAUSE the resistive element itself is the highest grade alloy wire obtainable and perfectly adapted to the purpose and size of the resistor.

and finally . .

BECAUSE Ohmite Resistors are the product of an organization of specialists making resistance units *exclusively.*

While we list an extensive line of standard sizes and styles, we can furnish special resistors in any quantity on short notice.

Prices and samples on request.

OHMITE

Ohmite Manufacturing Company

633 N. Albany Ave., Chicago, Ill.

Fixture Manufacturers Exhibit at Washington Show

Forty-four manufacturers of lighting fixtures and illuminating glassware exhibited their new designs at the Style Show of the Artistic Lighting Equipment Association and the Illuminating Glassware Guild at Washington, D. C., during the week of Feb. 10-15. The Style Show was held in the Washington Auditorium, and the sessions of the annual convention of the A.L.E.A. were held in the Mayflower Hotel.

B. F. Klein was elected president of the A.L.E.A., succeeding C. A. Bridges, and L. L. Reading was chosen vice-president, succeeding Herman Plaut. Newly elected directors are: Herman Plaut, Robert Biddle, Frank D. Gill, Robert S. Aspinwall, C. A. Bridges and E. W. Commery.

Several hundred lighting fixture dealers from all parts of the United States and Canada were reported to have attended the show and to have placed substantial orders with the manufacturers who exhibited.

While most of the manufacturers exhibiting their goods offered new designs, it would be difficult to say that any one trend characterized the new fixtures shown. Two years had passed since the last Style Show and it had been expected that there would be many new developments in the so-called "moderne art" type of fixture. With one or two exceptions, however, these developments were not forthcoming. Rather did the show give one the impression that "moderne art" is distinctly on the decline in lighting equipment as it is in the furniture field. Shaded light fixtures continued to be prominently displayed, as in recent shows. An absence of the candlestick type of fixture was evident, however.

J. F. Heffron, Maud Terrell, Henry D'Olier, A. L. Powell, Samuel G. Hibben, Arthur L. Abbott, E. W. Commery and Laurence W. Davis were the speakers at the sessions of the A.L.E.A. convention.

Government Agency Approves Sunshine Lamp

The use of artificial sunshine as an escape from "sun starvation" under modern living conditions has received the approval of the U. S. Public Health Service.

In an official bulletin issued recently, the first comprehensive statement on this subject ever released by a government agency, the Service goes on record as approving the use of health lamps which give an approximate duplication of natural sunlight, while at the same time warning the public against the use of "unscreened" devices producing short ultra-violet rays in unnatural intensity.

"Since the amount of natural light from the sun and especially its ultra-violet content varies with geographical location, the season of the year and such conditions as amount of dust, smoke and moisture in the atmosphere under some conditions, reliance must be placed on sources of artificial radiation," the statement reads.

Discussing the types of lamps being sold to the public, the Service points out that some lamps are so designed as to screen out the dangerous short ultra-violet light and heat radiation and are safe for use in the homes.

"These lamps," it states, "are so designed that the ultra-violet light and heat radiation emitted by them are combined as nearly as possible in the same proportions as in natural sunlight. Since the radiation from them is very similar to sunlight, they may to a certain extent be used in the place of, or as a substitute for, sunlight."

Ice Organization Girds for Refrigerator War

Manufacturers of electrical refrigerators are to be the objects of an advertising war to be waged against them by the National Association of Ice Industries, according to a declaration of the latter body in convention recently in Boston. Newspaper advertising by the association will play an important part, and ice dealers will be urged to tie in with the association's plan of campaign.

Temple Corp. Assets Purchased; Business Will Continue

Leonard C. Welling, president, K. W. Radio Company, New York, representing a syndicate of business men, has purchased the entire assets of Temple Corporation, Chicago. The syndicate will continue operations in the plant immediately. The trade name "Temple" will be continued.

The purchase includes all patents, good will, trade name, machinery, equipment and merchandise inventory, which is well above $1,000,000. Many of the former Temple distributors have already applied for distributor franchises and it is expected that appointments will be made soon.

Several merchandising innovations are being planned in order that the plant may continue running throughout the summer and during the off season.

Porcelain Insulators Division Approves Simplified Practice

Simplified Practice Recommendation No. 73, on one-piece porcelain insulators, has been reaffirmed by the standing committee of the industry without change, for another year, according to a recent anouncement by the Division of Simplified Practice of the Bureau of Standards, Department of Commerce. A survey of production conducted prior to the revision meeting indicated the degree of adherence to the recommendation to be approximately 91 per cent.

Simplified Packing Program for Flashlight Batteries

A simplification program for the packaging of flashlight batteries was approved at a recent conference of manufacturers, distributors and users of flashlight batteries, held under the auspices of the Division of Simplified Practice of the Bureau of Standards, Department of Commerce.

A similar simplification program on earphone batteries was approved by a general conference of manufacturers, distributors and users, held recently under the same auspices. The approved recommendations are subject to annual review by a standing committee of the industries.

New Services Are Listed by R. M. A. Board

Heading the list of new services adopted by the board of directors of the Radio Manufacturers Association at its February meeting in Cleveland, surveys of advertising practices will be offered to R.M.A. members. Following the association's recent success in a national reduction of 10 per cent in freight rates on radio receiving sets, with an annual saving of over a million dollars to manufacturers, it was reported that progress is being made in plans to secure other freight and express rate reductions.

An organization to protect radio interests against harmful or unfair legislation calculated to injure sales was reported effected, with 157 men at work in 31 States. Daily reports are made regarding radio legislation introduced anywhere.

General Electric Refrigerator Sales Jump 50 Per Cent

Sales of General Electric refrigerators for January, 1930 exceeded by 50 per cent the sales for the same month last year, according to a statement made by P. B. Zimmerman, general sales manager. Six million dollars will be expended this year in advertising and sales promotion, and it is expected to be the best in the history of electric refrigeration. The year 1928 saw an increase in sales of 400 per cent over 1927, the introductory year, and 1929 showed a 70 per cent jump over 1928.

Electrical Bookings Increased During Last Year

Total orders booked during 1929 by 81 manufacturers of electrical goods showed an increase of 25 per cent over 1928, or

To the Manufacturer Who Winds His Own Coils—

When the development of an improved winding process sets new and higher coil standards, it is worth while for you to investigate; to find out how you can profit by the purchase of coils made by that process.

The Rome Coil Department is prepared to supply a wide variety of coils for any purpose.

Particularly, the new method by which Rome Precision Heavy Wire Coils are wound not only improves the coils themselves, but also bears on component parts of the device to take the coils. It effects CUMULATIVE economies. Such economies are IMPORTANT.

Rome Coil Engineers are eager to demonstrate, by means of sample coils, the extent to which you can profit by the new principles involved in making Rome Precision Coils.

A demonstration of that sort will prove interesting. Write for it.

ROME WIRE COMPANY
Division of General Cable Corporation
ROME, NEW YORK

ROME PRECISION COILS

$1,290,193,618 during 1929 as against $1,029,721,508 booked during 1928. Lowest for the year were last quarter's orders, the total being $288,736,209, compared with $338,169,678 booked during the previous quarter, and $340,863,112 during the second quarter.

Every quarter of 1929 showed larger bookings than the corresponding periods of 1928.

New Employment Peak Reported by Allis-Chalmers

At the beginning of February, Allis-Chalmers Manufacturing Company, Milwaukee, employed more men than at any time during the high period of 1929. Since January 1st, 600 men have been added to the force, making a total of 9101, compared with 8964 last July, the peak for 1929. Increases in orders have brought about the enlarged force. In January 1929, the payroll included 8145 persons.

Hall Electric Company Elects A. D. Cameron

A. D. Cameron, formerly Eastern district manager of the Hurley Machine Company, Chicago, a General Electric subsidiary, has been named vice-president in charge of sales and purchasing of Hall Electric Company, Philadelphia. He was connected with the General Electric organization since 1911.

New Appointments Announced by Union Electric

Recent appointments by the Union Electric Manufacturing Company, Milwaukee, include: John R. Patterson as Chicago district manager; R. F. Luke, associate to Mr. Patterson; C. L. Russell from the Chicago office to the Milwaukee factory, as instructor of student engineers; and Garritt S. Felt, district manager at Omaha.

Eisler Electric Corp. Buys Tungsten Electric

Eisler Electric Corporation, Newark, N. J., has acquired Tungsten Electric Corporation, producer of tungsten and molybdenum products for the electrical equipment, automobile, aviation and other industries. The company will be known as Tungsten Division of Eisler Electric Corporation and will continue operations at 540-39th St., Union City, N. J.

Dr. Clemens Laise, president of Tungsten Electric, will continue as executive head of Tungsten operations.

Credit Meeting Will Be Held in Pittsburgh, May 22-23

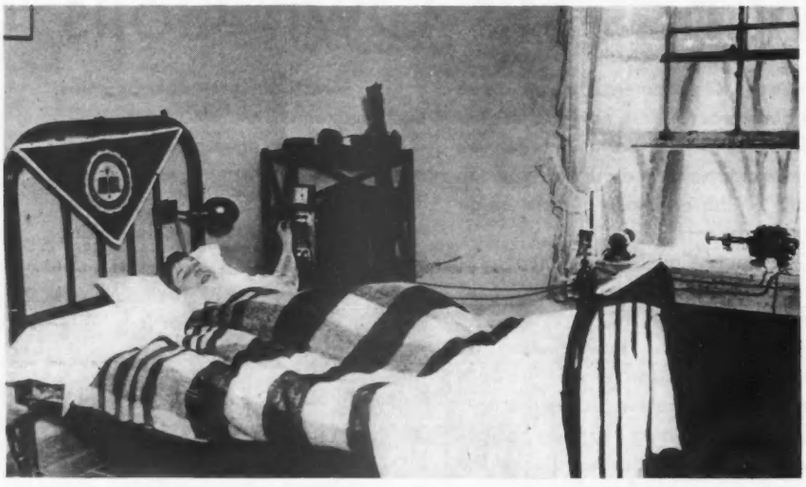
The thirty-second annual meeting of the National Electrical Credit Association will be held at the William Penn Hotel, Pittsburgh, Pa., Friday and Saturday, May 22 and 23, 1930 according to an anouncement by Frederic P. Vose, secretary of the association.

Yanochowski Is Named President of Kellogg Switchboard

Kellogg Switchboard & Supply Company, Chicago, has elected as president, G. A. Yanochowski, to succeed W. L. Jacoby, who died recently. Mr. Yanochowski has been associated with the company for the past 15 years, having entered its service in 1915 as assistant to the head of the legal department. In 1925 he assumed complete charge of this department in which capacity he served until his recent election.

After studying electrical engineering at the University of Illinois, Mr. Yanochowski worked in various capacities in a telephone factory. For several years he was a maintenance and installation engineer and later familiarized himself with the legal angle of the telephone business. He was admitted to the Illinois State Bar in 1919.

Arising in the Morning Is a Science



GIVEN A. BREWER, a sophomore at Western Reserve Academy, Hudson, Ohio, has invented a device which enables him to shut his window and turn on the heat by throwing a switch at his bedside before arising in the morning. The only catch we can see is the fact that he'll never get up now

Beg Your Pardon

In our February issue it was erroneously reported that General Kontrolar Company of Dayton, Ohio, had been taken over by Leland Electric Company also of Dayton. General Kontrolar has undergone no change of management and is now in the process of an important expansion program. Leland Electric Company has been licensed by General Kontrolar to use the trademark "Kontrolar" on all products coming under the license agreement. Gisbert L. Bossard is president of General Kontrolar Company.

Ross D. Cummings Joins Clements Manufacturing

Clements Manufacturing Company, Chicago, manufacturer of vacuum cleaners, has announced the appointment of Ross D. Cummings as assistant sales manager in charge of the jobber division.

For the past five years he has been identified with "The Jobber's Salesman." For fifteen years prior to that he was connected with Western Electric Supply Department. He has also been with the M. S. Wright Company.

Hurley Heads Manufacturers' Export Association

Edward N. Hurley, chairman of the board of the Hurley Machine Company, Chicago, and war-time chairman of the United States Shipping Board, has been elected president of the American Manufacturers' Export Association.

Westinghouse Unfilled Orders Rise 40 Per Cent

Unfilled orders totaling $65,000,000 at the beginning of 1930 have been estimated by Westinghouse Electric and Manufacturing Company, this being an increase of 40 per cent over the total at the start of 1929. New business this year has also shown an increase as compared with 1929.

Westinghouse estimates its net income for 1929, after all charges, at more than $26,500,000, or almost $10 a share on the 2,665,315 shares of common and preferred stocks outstanding. The 1928 earnings were $20,814,940, or $8.78 a share. Orders booked last year totaled about $240,000,000, as compared with $193,224,000 in 1928.

R. M. A. Committees at Work on Annual Show

Radio Manufacturers Association has chosen Ben G. Erskine of Emporium, Pa., as chairman of the convention committee, and plans are progressing for the annual

ANACONDA

from mine to consumer

REG. U.S. PAT. OFF.

USE ANACONDA WIRE in your product

YOUR product may be designed for the luxury trade, the average purchaser, or the low-price market. Whether it be custom-made or produced in quantity, *the electrical wires* that carry the current and make it useful *must be safe and dependable!*

The coordinated control by a single organization, responsible for every step in production *from ore to finished products,* assures the uniformly high quality of Anaconda flexible-cords, magnet wire and all rubber insulated wires and cables.

Use Anaconda wire in your product. Make use of the engineering facilities of this nationwide organization . . . Let us discuss your problems and requirements with you now.

Anaconda safeguards quality from mine to consumer—provides a nationwide service, prompt, dependable, complete.

ANACONDA WIRE & CABLE COMPANY

General Offices: 25 Broadway, New York

Chicago Office: 111 West Washington Street

Magnet Wire Mills at

Muskegon, Mich., Anderson, Ind., Sycamore, Ill.

Sales Offices in Principal Cities

convention and trade show at Atlantic City next June. Jess B. Hawley is Chairman of the trade show arrangements, and G. Clayton Irwin, Jr., trade show manager.

In addition to the Radio Manufacturers convention and trade show, there will be sessions of the National Federation of Radio Assciations, the national organizations of radio jobbers and dealers, a meeting of the Institute of Radio Engineers, and a meeting of the national organization of radio editors and writers, at Atlantic City during the convention week.

Coming Conventions

American Institute of Electrical Engineers.—District meeting at Springfield, Mass., May 7-10.

American Society of Mechanical Engineers.—Third National Materials Handling Meeting, Hotel Stevens, Chicago, March 5, 6, 7.

American Oil Burner Association.—Annual meeting at Chicago, April 7-12.

National Electric Light Association.—Annual convention, San Francisco, Cal., week of June 16, 1930.

National Electrical Manufacturers Association.—Spring meeting at The Homestead, Hot Springs, Va., May 18-23. Annual meeting at Old Point Comfort, Va., in October. (Exact date will be announced later.)

Radio Manufacturers Association.—Annual convention and exhibition, at Atlantic City, N. J., week of June 2, 1930.

Brevities

Truscon Steel Company, Youngstown, Ohio, has announced the appointment of Charles A. Haynes as manager of the transmission structures division.

Reliance Electric & Engineering Company, Cleveland, has promoted S. B. Taylor to the position of assistant works manager.

Electric Machinery Manufacturing Company, Minneapolis, recently received from Maine Seaboard Paper Company, of Augusta, Me., an order for five 3500-hp. synchronous motors for driving pulp grinders, and two 150-kw. synchronous motor generator sets.

Fibroc Insulation Company of Valparaiso, Ind., announces that J. L. Thompson has resigned as president of Thompson, Bassett & Wegel, Inc., Chicago, in order to join the Fibroc organization in charge of advertising and sales promotion.

Roller-Smith Company, New York, has promoted M. W. Seymour of the Bethlehem offices to the New York office as a sales engineer. H. D. Stier has been newly made company representative with offices in Atlanta; and H. N. Muller Company now represents the Roller-Smith Company with offices at Pittsburgh.

Meadows Manufacturing Company, Bloomington, Ill., has elected Hal M. Stone its president, to succeed H. L. Barker. Samuel Siddall and E. S. Ridgway were elected vice-presidents.

Proctor & Schwartz Electric Company has moved its plant from Cleveland, Ohio, to Seventh and Tabor Road, Philadelphia, Pa.

DeForest Radio Company has reduced prices on popular type radio tubes. Screen grid 424 has been reduced to $3 from $4, while A.C. power amplifier type 445 has been cut from $3.50 to $2.50.

Interstate Products Corporation has moved its office and factory from 29 Commercial St. to 503 Mulberry St., Newark, N. J.

Bakelite Corporation, 247 Park Ave., New York, manufacturer of phenol resinoid materials, is contemplating an early call for bids for initial units of a new plant at Bound Brook, N. J., where a 100-acre tract was recently acquired. The estimated cost will be over $200,000 with equipment. Francisco & Jacobus, 511 Fifth Ave., New York, are architects and engineers.

Geuder, Paeschke & Frey Company, Milwaukee, manufacturers of special stamped and drawn sheet metal articles, celebrated its fiftieth birthday recently with a golden anniversary banquet.

Superheater Company, New York, recently elected Frederick A. Schaff its president, and George L. Bourne, retiring president, its chairman of the board of directors. Mr. Schaff has been associated with the Superheater Company since 1913.

Detroit Reproducers, Inc., is the new name of the former Bryden Radio Products Company. The firm is located at Lafayette and Meldrum Sts., Detroit.

Grigsby-Grunow Company, Chicago, has announced the appointment of Edgar S. Riedel to the position of assistant sales manager, in charge of the Majestic tube division. Floyd D. Masters has been made territory representative, working with Harry Alter Company in Chicago and northern Illinois.

Dexter Rubber Manufacturing Company, Goshen, N. Y., has appointed as vice-president in charge of advertising and sales, Carlyle W. Myers, formerly general manager of the Virginia Carolina Rubber Co., Inc., of Richmond. The Dexter plant facilities have recently been increased from a capacity of 1,500,000 pounds of rubber products to 8,000,000 pounds.

Edison General Electric Appliance Company, Inc., Chicago, has appointed J. T. Miller and Gordon Scott as appliance specialists. Both were formerly at the Hotpoint Service Station, Denver. Thomas Maycock, formerly of the Salt Lake Service Station, is transferred to the Denver office.

Ceco Manufacturing Company, Providence, R. I., has reported an upward swing in employment to such an extent that the factory in February was working steadily until 9 p. m. each week night.

Branch Offices and Agencies

G. E. Wehner, Pittsburgh, has been named to represent M. B. Austin Company, Chicago, and Kopp Glass Company, Swissvale, Pa., in eastern Ohio, western Pennsylvania and West Virginia. Mr. Wehner maintains offices at 202 Investment Building, Pittsburgh. He seeks additional lines.

Stivers & Weber, manufacturers' representative, 33 W. 60th St., New York, has been appointed agent in the metropolitan district by Circle Flexible Conduit Company, manufacturer of armored cable, conduit and rubber covered wire.

James M. Hughes has opened an office at 67 W. 44th St., New York City, which will be his headquarters for representing manufacturers of electrical specialties in the metropolitan area.

National Carbon Company has transferred H. W. KaDell from its Cleveland research laboratory to the Eveready Raytheon Tube Division in New York, where he will function in the capacity of sales engineer in the general sales department.

Electric Machinery Manufacturing Company has announced the new location of its Detroit office is at 10-230 General Motors Building.

Standard Transformer Company, Warren, Ohio, will be represented in the Pittsburgh district by H. E. Burns Co., Inc., who will sell the complete line of Standard transformers.

Hygrade Lamp Company, Salem, Mass., recently opened a new branch office at Baltimore, Md., which will be in charge of Charles G. Pyle, district sales manager.

Reliance Electric & Engineering Company, Cleveland, has established an office at Toledo to serve northwestern Ohio, northern Indiana and southern Michigan. C. E. Stine will be in charge.

Cutler-Hammer, Inc., Milwaukee, announces that its Detroit district sales office is now located at 2755 East Grand Blvd., Detroit. The new location includes warehouse facilities where the company's products are stocked for immediate delivery.

George H. Scofield, who has covered the New England States for the past fifteen years, seeks electrical lines for representation in this territory. He may be addressed at 605 W. 178th St., New York City.

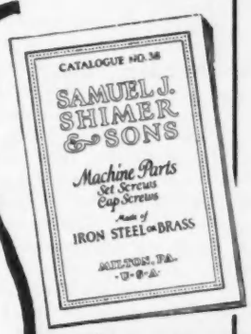
Frankle & Gordon, Inc., 744 Lexington Ave., New York City, desires to become a manufacturer's agent for a line of electrical appliances or devices in the metropolitan district.

H. J. Snyderman Company, 1063 Howard Ave., San Francisco, wishes to hear from manufacturers who are seeking an agent on the Pacific Coast for a line of appliances, equipment or radio. Wm. A. Sanderlin is now in charge of the company's Northwestern office at 912 Western Ave., Seattle, Wash.

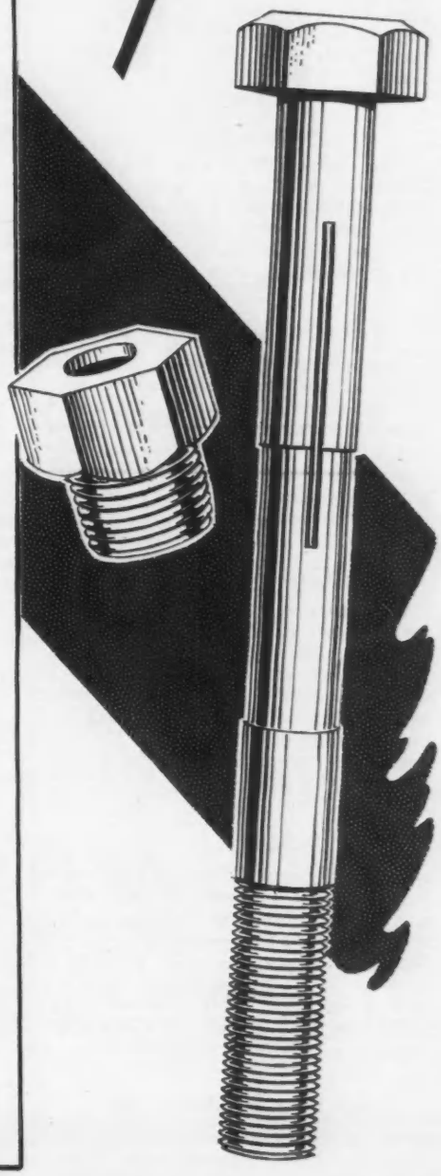
Variety

¶ In industry, as in all walks of human life, *variety* puts a "kick" in our existence. So it is with SHIMER in the making of a *variety* of little and big things for an imposing number of varying industries.

¶ SHIMER offers, and gives, specialized cooperation to Electrical Manufacturers in the production of screw machine parts in brass, iron and steel, and in this production, be it one thousand or a million parts, accuracy and uniformity is assured through frequent inspection as the job progresses.

¶ SHIMER facilities and ripe experience make certain of deliveries when promised. Send us samples from which we may quote our prices—and you'll find them interesting.

SAMUEL J. SHIMER & SONS
Milton, Pa.

Screw Machine Products



Financial

Altorfer Bros.

Altorfer Brothers Company, maker of ABC washers in Peoria, Ill., announced a one-third increase of business in January, 1930, over January, 1929.

Kelvinator Corp.

Kelvinator shipments for the first four months of the fiscal year ending Jan. 31, 1930, show an increase of 53 per cent over the same period of 1929, according to H. W. Burritt, vice-president in charge of sales of the Kelvinator Corporation, Detroit.

Crosley Radio

Crosley Radio Corporation, Cincinnati, for the year ended December 31, 1929, reports a net profit of $1,085,823, which compares with $3,605,973 in 1928. Net sales for the year totaled $15,525,612, comparing with $17,460,829 in the previous year.

Allis-Chalmers

Allis-Chalmers Manufacturing Company, Milwaukee, shows a net profit for 1929 of $4,330,888, comparing with $2,933,909 in 1928. Unfilled orders at the close of 1929 amounted to $12,872,676 against $9,681,-214 at the end of 1928.

Grigsby-Grunow

Grigsby-Grunow Company, Chicago, maker of Majestic radio, reported sales for the month of January, 1930, were $5,368,788.16, as against $5,255,975.28 for January, 1929. Sales of dealers were substantially in excess of the company's production, according to B. J. Grigsby, president of the company.

Cutler-Hammer

Preliminary report of Cutler-Hammer, Inc., for year ended Dec. 31, 1929, shows net income of $2,687,000 after interest, federal taxes, etc., equivalent to $9.77 a share on 275,000 shares of no-par stock. In preceding year the predecessor company, Cutler Hammer Manufacturing Co. and subsidiaries reported net income of $1,441,-218 or $5.24 a share.

Square D

Report of Square D Co. for year ended Dec. 31, 1929, shows net profit of $503,829 after interest, federal taxes, etc, equivalent after dividend requirements on the $2.20 class A prefered stock to $6.28 a share on 49,371 no-par shares of class B common stock. This compares with $428,097 or $5.01 a share on 45,488 class B shares in 1928.

Copeland Products, Inc.

Rate of production of Copeland Products, Inc., during February was 70 per cent in excess of the same month in 1929, according to a recent statement. Schedules for March contemplate a 20 per cent increase over the output a year ago.

Ken-Rad Tube & Lamp

Ken-Rad Tube & Lamp Corporation, Chicago, reports a net profit of $258,155 for the year 1929, as compared with a net profit of $347,010 in 1928.

Zenith Radio

Zenith Radio Corporation, Chicago, reports that profits during January were the largest for any January in the company's history. Net profits for the month were $57,502, as compared with a loss of $27,273 for the same month a year ago. For nine months ending Jan. 31, 1930, net profits were $130,256.

DeForest Radio

Receivership proceedings against the DeForest Radio Corporation were dismissed recently, following a hearing in Chancery Court. James W. Garside, president, placed the company's net profit for eighteen months ending Dec. 31, 1929, at $626,424. During January, 1930, Mr. Garside said that business had increased 24 per cent over December, 1929.

Arcturus Radio Tube

A 400 per cent increase in sales and a 473 per cent increase in net income were noted by Arcturus Radio Tube Company, Newark, N. J., in its showing for 1929. Net income was $538,429, and total sales $5,507,702. During 1929, the company invested $1,681,061 in new plants and equipment.

Driver-Harris

Driver-Harris Company, Harrison, N. J., reported a net profit of $953,507 for 1929, which compares with $273,816 in 1928. Current assets as of Dec. 31, 1929 were shown as $2,320,940, and current liabilitiees as $317,698.

Manufacturers' Literature

ELECTRICAL MANUFACTURING *presents a digest of recently issued catalogs, bulletins and other advertising material. Manufacturers are invited to send literature for review in this column.*

Mattatuck Manufacturing Company, Waterbury, Conn. A 32-page catalog devoted to the description and illustration of the Mattatuck line of upholstery nails and furniture glides. A section of the publication deals with felt feet for use, among other things, on clocks, cabinets and loud speakers.

H. O. Swoboda, Inc., Pittsburgh, Pa., has a stock of leaflets describing its "Falcon" electrically heated compound melting tank. These are reprints of an article which appeared in the February issue of "Fuels & Furnaces."

American Blower Corporation, Detroit. A new broadside which illustrates installations of Ventura ventilators in manufacturing plants, forge shops, grinding departments and other types of rooms where electric ventilation is necessary.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Leaflet 20429, describing type RH motor and drum-type starting switch. Circular 1705-B, 20 pages, type DL carbon circuit breakers.

Hyatt Roller Bearing Company, Harrison, N. J. Revised bulletin of dimension and capacity tables of Hyatt roller bearings and their applications.

Schauer Machine Company, Cincinnati. Catalog No. 30, covering the complete line of "Ideal" electric drills, screwdrivers and grinders. Specifications in detail are accompanied by clear illustrative material.

Ohmite Manufacturing Company, 636 N. Albany Ave., Chicago. A new publication on the subject of vitreous enameled resistance units. Six different terminal types of units, available in about 30 different sizes, are listed. They are: Standard lug type, heavy lug type, flexible lead units, ferrule type units, cartridge type units, Edison base units and units made in accordance with American Railway Association standards.

Gray Instrument Company, 64-70 W. Johnson St., Germantown, Philadelphia. Bulletin E-4, describing this firm's potentiometers, resistance boxes, Wheatstone bridges and other electrical measuring instruments.

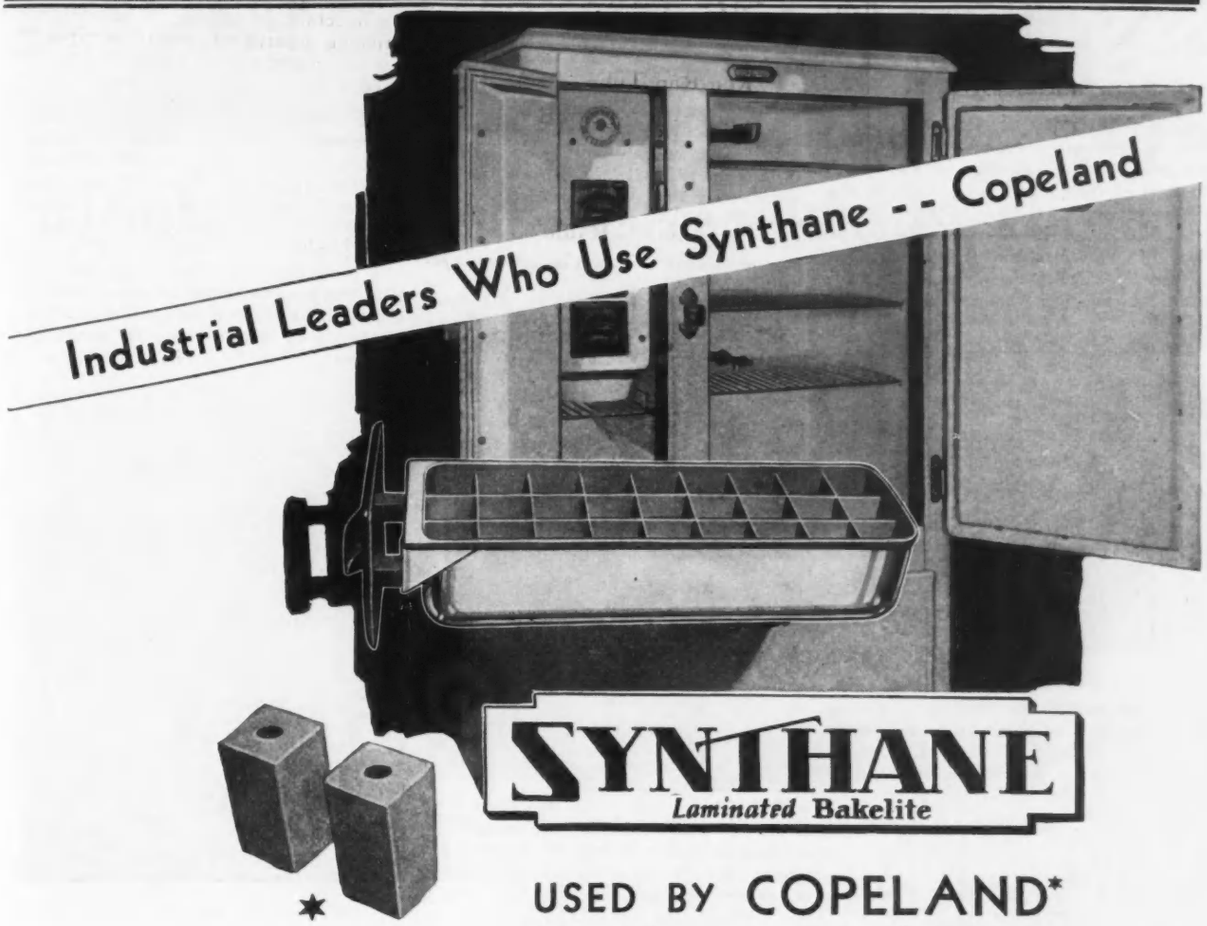
Cutler-Hammer, Inc., Milwaukee. "Practical Pointers on the Selection of Motor Control," a new publication issued by this company. The booklet stresses in particular the features to consider when selecting motor control. It tells how to choose control to suit the motor's load and how to select control for direct current motors and also alternating current motors. Care has been taken to present all information in non-technical language as much as possible. Numerous illustrations accompany the text.

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Ave., New York City.

"L R Co" Receptacles.
"Aspinall" Soldering Fluid.
"Burrows" Therapeutic Lamp.
"Williams" Commutator Dressing.
"Flint" Waffle Iron.
"Hillcrest" Line of Lighting Fixtures.
"Defiance" Cigarette Lighter.
"Pioneer" House Pumps.
"Indulet" Fittings.
"Thermodyne" Therapeutic Lamp.
"Rayo" Fuse Plug.
"Autochauffe" Heater for Bakery Ovens.
"Wilson" Box Supports.



USED BY COPELAND* For Electric Refrigerators

If you are as keenly alive to the improvement of your product as Copeland Products, Inc., nationally known manufacturers of electric refrigerators, it is logical to assume that you are equally as interested in Synthane laminated Bakelite.

For instance, Copeland finds it possible to drill and tap holes in Synthane without danger of cracking and chipping. Its uniformity in structural strength, machining qualities and appearance assures them a structural material in conformity with the high quality of their product.

As structural insulation, you will find Synthane laminated Bakelite absolutely dependable and uniform in high dielectric strength, low moisture absorption, low surface leakage, easy machineability, structural strength, dimensional accuracy and appearance.

We will gladly send you samples for testing. Perhaps your results will be as gratifying as those of Copeland.

COPELAND* Products, Inc.,

manufacturers of high grade electrical refrigerators, use Synthane as spacers between the ice cube tray and the front cover of the tray which fits snugly against the coil compartment. This materially decreases the condensation of moisture and subsequent formation of ice. Copeland finds that Synthane drills and taps easier and is more uniform in structural strength, machining qualities and appearance than materials previously used.

SYNTHANE
CORPORATION OAKS · PENNA

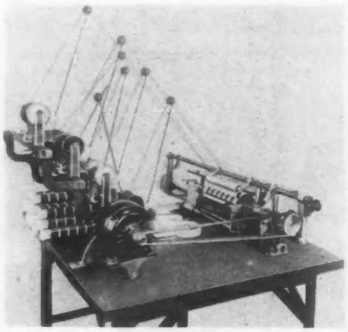
NEW YORK, CHICAGO, CLEVELAND, SAN FRANCISCO

Sheets, Rods, Tubes, Fabricated Parts

New Goods for Your Inspection

Coil Winding Machine

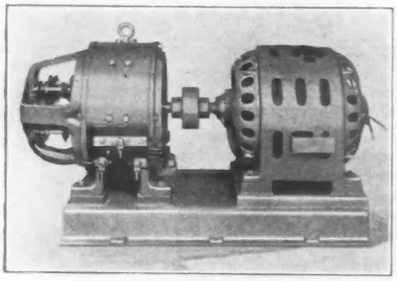
Acme Electric Mfg. Co., 1444 Hamilton Ave., Cleveland, is manufacturing multiple coil winding machines which has a capacity of from 6 to 12 coil windings at a single operation, winding sizes of wire from No. 26 to No. 42 gage. The operation of the machine is accomplished through double motor drive, the main motor driving the winding spindle while



the auxiliary motor operates the feeding mechanism, spacing the wire so that any specified number of turns are put on each layer of the coil.

At the end of each layer through a cam mechanism together with a mercury switch, glassine paper is automatically inserted in the winding.

Motor Generator Sets with Arc Welded Bases



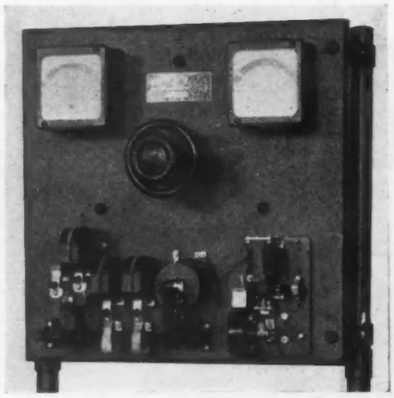
The Reliance Electric & Eng. Co. 1042 Ivanhoe Rd. Cleveland, has adopted as standard electrically welded steel bases for the motor generator sets manufactured by this company.

The tops and ends of the bases are completely closed to prevent the collection of dust and the pads upon which the motors and generators rest are lined horizontally and vertically. Horizontal alignment is maintained by the use of special fixtures.

Motor Starter and Meter Relay

General Electric Co., Schnectady, N. Y., is marketing a retangular type of meter with non-glare glass and an improved type of field actuating relay having synchronous motor starters. The operation of the field actuating relay which controls the field contactor is dependent upon the speed of the motor and, in addition, a time relay after the motor reaches approximately 95 per cent speed.

When full voltage is applied to the motor the immediate closing of the relay contacts is prevented by a lock out coil in parallel with the discharge resistor and energized by the voltage across this resistor. The closing of the relay contact may be delayed after the lock-out coil releases the timing mechanism. This relay insures that the motor will accelerate its load to maximum possible speed before the field voltage is applied.



The lock-out coil holds the relay contact arm motionless until the motor accelerates to approximately 95 per cent of synchronous speed, when the voltage across the resistor decreases and allows the lock-out coil to release the timing mechanism.

Flush Motor Plug

Harvey Hubbell, Inc., Bridgeport, Conn., announce a three-wire twist lock flush motor plug designed for 20 amperes and 250 volts. Designated as Schedule H, the device is composition material enclosed in a metal case and the cord grips of the body accommodate 23/32 in. diameter cords. The diameter of the casing flange is 2⅞ in. and the diameter of the casing base is 2 3/32 in., while the depth of the casing is 1 19/32 in. The plugs are furnished with three mounting screw holes spaced 120 deg. apart on a 1¼-in. radius.

Weston Heat Flow Meter

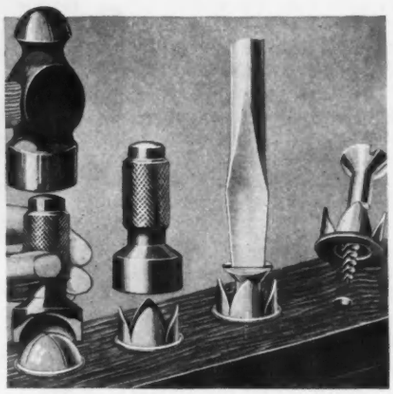
Weston Electrical Instrument Corp., Newark, N. J., is marketing a Model 553 Heat Flow Meter that is a small and compact, portable electrical device for the direct measurement of heat loss through surfaces. It consists of a sensitive millivoltmeter and three thin rubber belts, one of which contains a large number of thermocouples which are brought out to binding posts at the end of the belt connection to the meter. The other two are plain rubber belts for equalizing the heat flow.

The meter is a four binding post instrument equipped with a 5-in. scale figured for three ranges, 0-240 and 0-120 (B.t.u. per hour, per square foot) and 0-18 millivolts. The first two ranges have 120 scale divisions and the third range has 90 divisions. The resistance of the meter is 250 ohms for 18 millivolts.

A compensating rheostat is provided for adjusting the instrument to room temperature, and the device is inclosed in a mahogany case with hinged cover. Its size is approximately 7 by 7 by 4 in.,

Rawlplug Crowner

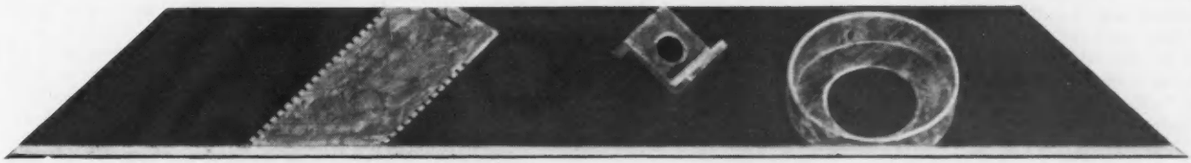
The Rawlplug Co., Inc., 66 W. Broadway, New York City, announces to the trade a device for sealing and concealing all forms of screw heads, bolts, nuts, etc. The devices are made of brass in all finishes and are intended to hide from view the heads or ends of fastening devices such as those mentioned, and at the same time prevent their removal. They are easily applied and are sealed in place by means of a special Crowner punch. The Crowners may be had in any size.



Hascrome Welding Rod

Haynes Stellite Co., 30 E. 42nd St., New York City, has placed on the market a manganese-chrome-iron welding rod called Hascrome. This is a self-hardening alloy, designed primarily for building up badly worn parts preparatory to surfacing them with Haynes Stellite, which is also supplied in the form of welding rod. Since the cost of Hascrome is materially less than that of Stellite, the resulting composite surface is much cheaper than if entirely built up of the latter alloy. Hascrome may be used for building up large sections of steel or cast iron, and forms an excellent base for Stelliting because it is sufficiently hard to resist deformation under impact, and because of the ease with which Stellite flows onto it. Although in some cases Hascrome alone may be used for hard surfacing parts subject to abrasive wear, it does not possess real hardness to the same degree as Stellite, and it will wear away more rapidly.

The new alloy is also applied to oil-well drilling tools as a matrix for diamond sub-



Moulded and stamped with micrometer accuracy to any size and shape

THOUSANDS of shapes in thousands of sizes are being formed from Micanite, the original built-up mica insulation. Motors, generators, control apparatus, instruments, electrical heaters and similar devices are being protected by the outstanding characteristics of this age-resisting electrical insulation.

Micanite possesses great resistivity, physical strength and chemical stability. It has, in addition, the property of being readily stamped or moulded from sheets into any desired form. Tolerances are held to micrometer accuracy.

The illustrated Micanite shapes picture the scope of this electrical insulation. Tubes 130″ in length and 10″ in outside diameter indicate the extreme sizes to which Micanite can be formed.

Samples of Micanite in many varied shapes are freely offered for your inspection. A letter will receive our immediate attention.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.
Cleveland Pittsburgh Seattle Cincinnati San Francisco
Birmingham Los Angeles Montreal and Toronto, Canada
Works: Schenectady, N. Y. London, England

PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF

MICA INSULATION OILED CLOTH INSULATION

stitutes. The oxy-acetylene process is considered best for the application of Hascrome, since the hardness of the deposited metal may be controlled by the amount of excess acetylene used in the welding flame, as well as by the rate of cooling. The greater the excess of acetylene in the flame and the slower the cooling rate, the harder the deposit will be. When quenched, the metal becomes softer and tougher.

The Hascrome deposit has a tensile strength of 40,000 lb. per sq. in., and can be forged but not machined.

Hascrome welding rod can also be applied by means of the metallic arc process, by the use of reverse polarity, making the rod the positive electrode. Care must be taken to prevent cracking after quenching when this method is employed. Arc-welded deposits have a hardness of 240 to 400 Brinell, depending on the rate of cooling.

Hascrome is available in welding rods ½ in. in diameter and 36 in. long, packed in bundles of 50 lb. each. Sample lots of 5 lb. are also obtainable.

Insulated Wire Stripper

The France Mfg. Co., 10321 Berea Rd., Cleveland, is marketing an insulated wire stripper that may be had in two models, the Junior and Senior. The smaller model will strip wire up to ½ in. in diameter and the larger size will accommodate wire up to ⅞ in. in diameter over the insulation. The machines are driven by ⅛-hp. motors

and can be furnished for either direct or alternating current.

Cutting knives rotate within the case of the machine and all moving parts are amply protected. The machines weigh 61 lb. and are controlled by a foot pedal.

The stripping mechanism is easily adjusted to any desired wire size, and any length of stripping may be had. Either single or stranded wire can be stripped, and in the case of stranded wire the machine automatically twists the strands into a straight and compact unit.

Matched Frame Motor

Baldor Electric Co., 4351-55 Duncan Ave., St. Louis, announces to the trade a specially designed type of matched frame motor intended primarily for use on fans and blowers.

In redesigning the stators and end plates, provision was made for the various types of motors and also for the odd frequencies so that greater uniformity is possible. The various types including three single phase windings, split phase, repulsion induction and condenser type, as well as corresponding ratings in direct current and polyphase with identical frame construction, both in appearance and dimensions. Odd frequencies when used where 1800 r.p.m., 60-cycle types are standard, require drilling of two extra holes in base only. When used where 1200 r.p.m., 60-cycle types are standard, no change is required.

Thrust and lubrication problems are eliminated by the use of ball bearings. The

repulsion induction, polyphase and split phase types are of the constant speed types. The direct current and condenser types can be provided with controls for variable speed.

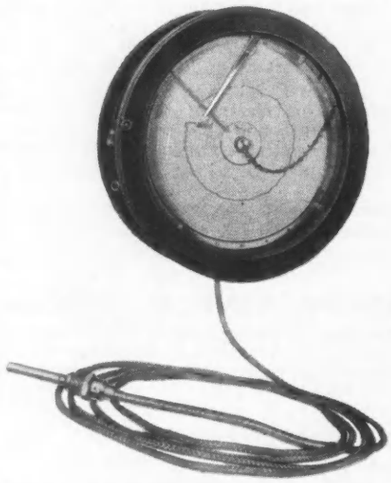
For the condenser motor special controls have been developed to meet the needs of variable speed fan service. Motors up to ¼ hp. are in production in this type. Motors in larger sizes are under development.

Akra-Ohm Resistors

Shallcross Mfg. Co., Collingdale, Pa., is manufacturing Super Akra-Ohm resistors, non-inductively wire wound for such purposes as laboratory uses, high voltage regulators, plate resistors and other applications requiring resistance. A special feature of these devices is that they are constructed in sections, each section being wound in the opposite direction by a special process.

Recording Thermometer

Moto Meter Gauge & Equip. Corp. of Long Island City, N. Y. has placed on the market a recording thermometer designed

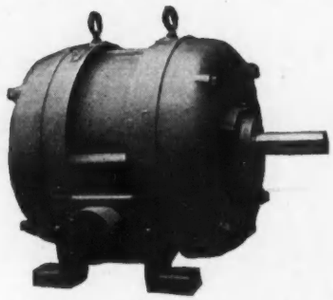


to chart temperatures ranging from minus 40 to plus 750 deg. Fahr. It is known as the Model 1000 Motoco Recording Thermometer. It consists of a dust, fume and moisture-proof housing inclosing all parts. The element comprises a bulb, capillary tube and Bourdon tube, filled solidly with a special liquid which has an equal coefficient of expansion over the entire scale range.

When the bulb is subjected to heat or cold, the liquid content expands or contracts and this action is transmitted through the capillary tubing to the Bourdon tube, causing the latter to wind or unwind and move a pen across the face of the chart actuated by a 24-or 7-hour clock mechanism. The ratio between the pressure of the liquid and the movement of the pen is one to one so that levers, hair springs, screws, gears, and other delicate parts are eliminated. A compensating spring takes up any difference between the bulb and room temperature and automatically resets the pen at the point on the chart corresponding with the bulb temperature.

Fan-Cooled Enclosed Motor

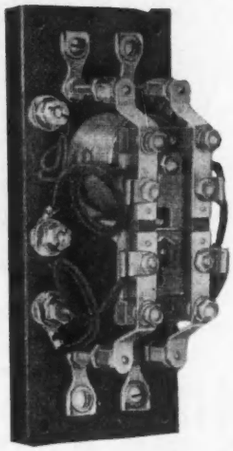
Cleveland Electric Motor Co., Cleveland, announces an improved fan-cooled, semi-enclosed motor that can be supplied in frames of the same size as those of the open type. In addition to changes in frame construction the electrical design has been modified so that these motors may be used



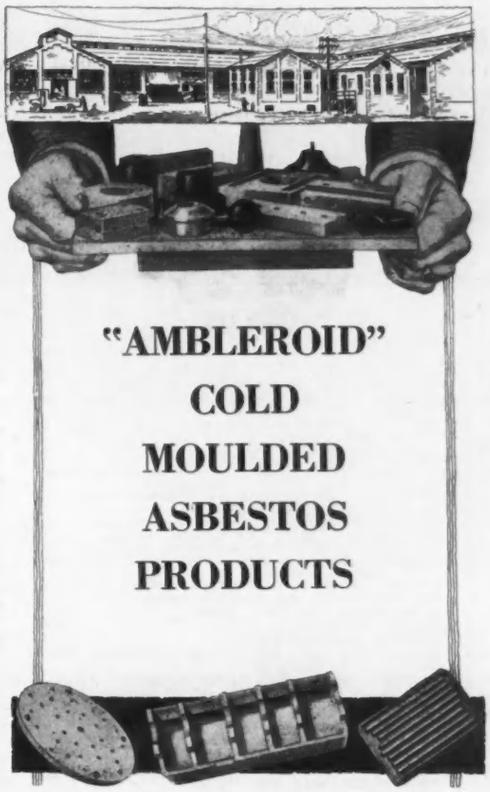
in either two or three phase service. The frame construction is to be supplied as standard in squirrel cage and slip-ring motors, both ball bearing and sleeve bearing types, for general purposes multi-speed or elevator applications.

Dunco Relay

Struthers Dunn, Inc., 134 N. Juniper St., Philadelphia, Pa., has introduced a double pole, double throw relay Type DDBL8



with four separate circuits. It is said to snap into action instantly and to be applicable for a large variety of uses.



Let Ambler estimate on your needs for Cold Moulded Asbestos for electrical appliances . . . .

Both Black and White Cold Moulded Asbestos Products are manufactured according to customers' specifications. Full explanation of the differences in these two varieties, as well as the characteristics and uses of Ambler Ebonized Asbestos in sheet form, are contained in the new electrical catalog now on press. Write us for a copy.

When any work arises on which you believe cold moulded asbestos can be effectively used, ask our Engineering Department for recommendations.

Ambler Asbestos Shingle and Sheathing Company

Ambler, Penna.

AMBLER-EBONIZED-ASBESTOS

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of ELECTRICAL MANUFACTURING is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore.

ALLOYS, LIGHT METAL
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa, Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.

AMMETERS. See Instruments.

ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.

ARMATURE & COIL SPRAY GUNS. See Spraying Outfits.

ARMORING MACHINES. See Wire Manufacturing Machines.

ARMS, FLEXIBLE. See Tubing Flexible Metallic.

ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Forode & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa.
Decalseo, Inc., Wayne, Mich.
Electrobestos. See Johns-Manville Corp.
Forode & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zollite. See Decelece, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BAKELITE MOULDS. See Dies, Die Makers.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Armature Coil Equip. Co., 2415 Forestdale Ave., Cleveland, O. (Machine).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Sundstrand Machine Tool Co., Rockford, Ill.
Twentieth Century. See Sundstrand Machine Tool Co.
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
Anaconda. See American Brass Co.
American Brass Co., Waterbury, Conn.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa
Homer Commutator Co., 4748 Hough Ave., Cleveland.
Rome Brass & Copper Co., Div. of Revere Copper & Brass, Inc., Rome, N. Y.

BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.
American Ring Co., Waterbury, Conn.

Aladdin Mfg. Co., Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Hemill Products, Inc., 103 Mott, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS. Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn.
Durco. See Struthers Dunn, Inc.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Struthers Dunn, Inc., 134 N. Juniper, Philadelphia, Pa.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Aetna Ball Bearing Mfg. Co., Chicago, Ill.
Ahlberg Bearing Co., 312 E. 29th, Chicago, Ill.
Auburn Ball Bearings Co., 73 Clarissa, Rochester, N. Y.
Bantam Ball Bearing Co., South Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Commercial. See Schatz Mfg. Co.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearing Co., Poughkeepsie, N. Y.
Gurney. See Marlin-Rockwell Corp.
Gwilliam Co., 360 Furman, Brooklyn, N. Y.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co. (Nicetown), Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Schubert. See McGill Metal Co.
S R B. See Standard Steel & Bearings, Inc.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.
Zubler Bearings Co., 1321 W. Tioga, Philadelphia, Pa.

BEARINGS, Oil-Less
Argute Oilless Bearings Co., 149 Berkeley, Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogert & Hepper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., 880 E. 72nd, Cleveland, O
Electric Railway Equipment Co., 30 Church, New York, N. Y.
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Moraine Products Co., First & Foundry Sts., Dayton, O.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich.
Reliance. See Metal Saw & Machine Co.
Seib Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Adjustable Bearing Co., 101 Transportation Bldg., Indianapolis, Ind.
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Durex. See Moraine Products Co.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.

Ball and Socket Joint
INSULATORS
ask for samples
STRUTHERS DUNN, INC.
134 North Juniper Street, Philadelphia, Pa.

Lumen Bearing Co., Buffalo, N. Y.
Moraine Products Co., First & Foundry Sts., Dayton, O.
National Bearing Metal Corp. (More-Jones Brass & Metal Div.), 4930 Manchester Ave., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Dayton Rubber Mfg. Co., Dayton, O.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.
Todd Drain-A-Tub Co., 1108 Walnut, Kansas City, Mo.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BENDING. See Punching & Bending.
BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Reading Elec. Co., Inc., 24 Frankfort, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.

BLUESTONE. See Chemicals, Battery.
BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOMBARDING MACHINES. See Machines, Lamp Making.
BOWL HOLDERS. See Fixture Fittings.
BOX & CABINET BUSHINGS. See Bushings, Box & Cabinet.

BOX BOARD
Container Corp. of America, 111 W. Washington, Chicago.
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Fibre
Container Corp. of America, 111 W. Washington, Chicago.
Corrfibre. See Container Corp. of America.
Mid-West Box Co., 111 W. Washington, Chicago.
BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Agar Mfg. Corp., Whippany, N. J.
Brown & Bailey Co., 417 N. Eighth, Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, 111 W. Washington, Chicago.
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 325 Decatur, Sandusky, Ohio.
Huntington Paper Box Co., Huntington, Ind.
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 86, Chicago
National Folding Box Co., New Haven, Conn. (Cartons.)
Pequot Mfg. Corp., Glendale (L. I.), New York.
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
River Raisin Paper Co., Monroe, Mich.
Rockford Fibre Container Co., Rockford, Ill.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.

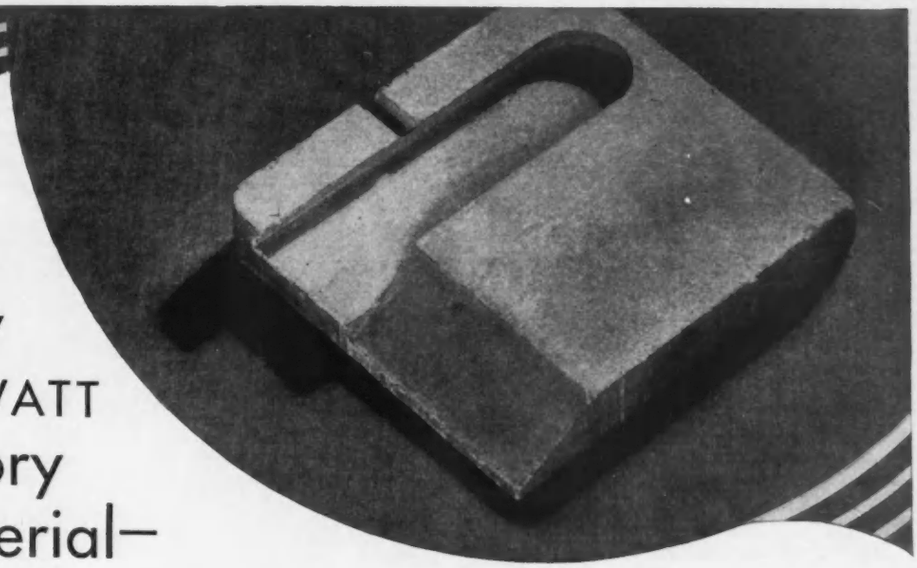
BRACKETS, Instrument
For Suspending Meters to Station Switchboard.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 220 Broadway, New York, N. Y.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

BRAIDING MACHINES. See Wire Manufacturing Machines.

BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
Anaconda. See American Brass Co.
American Brass Co., Waterbury, Conn.
American Nickeloid Co., Peru, Ill.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, Div. of Revere Copper & Brass, Inc., Baltimore, Md.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Buffalo Bronze Die Cast Corp., 100 Arthur, Buffalo, N. Y
Dallas Brass & Copper Co., Div. of Revere Copper & Brass, Inc., 820 Orleans, Chicago, Ill.
Durbar. See Buffalo Bronze Die Cast Corp.
Electric Materials Co., North East, Pa.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Higgins Brass & Mfg. Co., Div. of Revere Copper & Brass, Inc., 12435 Dequindre, Detroit, Mich.
Johnson Bronze Co., New Castle, Pa.
Michigan Copper & Brass Co., Div. of Revere Copper & Brass, Inc., 5851 W. Jefferson Ave., Detroit, Mich.
Nickeloid. See American Nickeloid Co.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Taunton-New Bedford Copper Co., Div. of Revere Copper & Brass, Inc., Taunton, Mass.
Titan Metal Mfg. Co., Bellefonte, Pa. (Rods and Forgings.)
Western Cartridge Co., East Alton, Ill.

BREAKERS, Circuit. See Circuit Breakers.
BRIDGES, Wheatstone. See Instruments, Laboratory Standard.
BRONZE. See Brass, Bronze and Copper; also Castings.
BRONZE, Phosphor. See Phosphor Bronze.
BRONZE POWDER, Aluminum. See Aluminum.
BRUSH HOLDERS. See Brushes, Commutator.



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It came out of all his tests in its original form—uncracked and unwarped, and without any indication of structural weakness whatever.

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Factories: Bridgeport and Meriden, Conn. Sales Offices: New York and Chicago

MONOWATT *for greatest value*

BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR

(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See B
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W

Automotive Mfg. Co., Kansas City, Mo. ..... B ..
B. B. B. See Becker Bros. Elec'l Corp.
Baylis Co., Bloomfield, N. J. ..... B ..
Becker Bros. Elec. Corp., 23 N. Jefferson, Chicago, Ill. ..... C W S H L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y. ..... C .. ..
Bezill-Brosel Carbon Co., Columbia Park, O. C .. .. B ..
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C .. ..
Carbon Engrg. Co., Slinger, Wis. ..... C L
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O. ..... C .. ..
Carbon & Graphite Corp., 227 West Broadway, New York, N. Y. ..... C .. ..
Carance. See Carbon Engineering Co.
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y. ..... C W S .. L
Columbia Machine Wks. & M. L. Co., 363 Chestnut, Brooklyn, N. Y. .... B ..
Cooley Mfg. Co., 98 Park Place, New York .. W .. .. ..
Diamond C. See Chapin Co., Chas. E.
Dixon Crucible Co., Joseph, Jersey City ....
Electra. See Automotive Mfg. Co.
Electric Accessories Co., 810 York Ave., Philadelphia, Pa. .... B ..
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa. ..... C .. ..
Eureka Metal Products Corp., 91 Clay, North East, Pa. .... W S H ..
Fleck Carbon Co., 508 Broome, New York C .. ..
General Electric Co., Schenectady, N. Y. .... C .. .. H L
Graphalloy. See Graphite Metallizing Corp.
Graphite Metallizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y. ..... C .. .. H ..
Henrite Products Co., 98 Park Place, New York, N. Y. ..... C .. ..
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio .... B ..
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.) ..... C .. ..
Kearstone Carbon Co., 4630 N. 11th, Philadelphia, Pa. ..... C .. ..
Kohlenite Products Co., 92-94 152nd St., Jamaica, N. Y. ..... C .. ..
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 4851 Grand Central Terminal, New York, N. Y. C .. ..
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. ..... C .. ..
Morganite Brush Co., 33-03 48th Ave., Long Island City, N. Y. ..... C .. ..
National Carbon Co., Cleveland, O. ..... C .. ..
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio ..... C W L
Ohio Elec. Specialty Mfg. Co., Troy, O. .. W .. .. ..
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C .. ..
Pure Carbon Co., Wellsville, N. Y. ..... C W S .. L
Pyramid. See National Carbon Co.
Reactlen. See Baylis Co.
Reading Elec. Co., Inc., 24 Frankfort, New York, N. Y. ..... C L
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. .... W L
Salem Electrical Supply Co., Salem, Mass. .. W .. .. ..
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. ..... C .. ..
Speer Carbon Co., St. Mary's, Pa. ..... C .. ..
Stackpole Carbon Co., St. Mary's, Pa. .... C .. ..
Sterling. See Carbon Laboratories Co.
Superior Carbon Products Co., North Rd., Poughkeepsie, N. Y. ..... C .. ..
U. S. Graphite Co., Saginaw, Mich. ..... C .. ..
Universal. See Graphite Metallizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L

BRUSHES, PNEUMATIC SPRAYING. See Spraying Outfits, fits.

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Wks., Corning, N. Y.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.

BUNCHING MACHINES. See Wire Manufacturing Machines.

BUS BAR. See Brass, Bronze and Copper. Also Aluminum.
BUSHINGS, SHAFT. See Bearings and Bushings.

BUSHINGS, Box and Cabinet, Porcelain

Appleton Electric Co., 1704 Wellington Ave., Chicago, Ill.
Columbia Metal Box Co., 226 E. 144th St., New York, N. Y.
Harter. See Multi Elect. Mfg. Co.
Knox Porcelain Corp., Knoxville, Tenn.
Mineralac Electric Co., 25 N. Peoria, Chicago, Ill.
Multi Electric Mfg. Co., 216 N. Ogden Ave., Chicago, Ill.
Nelson Elec. Co., Plant City, Fla.

CABINET GRILL CLOTH See Cloth, Untreated.

CABINETS, Fibre

Continental-Diamond Fibre Co., Bridgeport, Pa.
Vulcanoid. See Continental-Diamond Fibre Co.

CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
All-Steel-Equip. Co., Aurora, Ill.
American Metal Wks., 4868 Stanton Ave., Philadelphia, Pa.
American Steel Furniture Co., 27 W. 24th, New York, N. Y.
Artisan Sheet Metal Corp., 53 Gorham, Rochester, N. Y.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 551 W. Monroe, Chicago, Ill.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Chicago Hdwe. Foundry Co., 209 W. Randolph, Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 73 E. Sixth, Portland, Ore.
Cole Electric Products Co., 33 Crescent, Long Island City.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Creiger Electrical Mfg. Co., 609 W. Lake, Chicago, Ill.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Apparatus Co., 704 N. Halsted, Chicago, Ill.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Federal Steel Products Co., 3 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dall Mfg. Co., 311 N. Tenth, Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
Lorentzen, H. K., 155 Leonard, New York, N. Y.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Par-Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Renloh. See Holzer Sheet Metal Works.
Robbins & Myers, Inc., Springfield, O.
Security. See Aurora Steel Products Co.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 258 46th, Brooklyn, N. Y.
Superior Switchboard & Devices Co., 429 Schroyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 316 Colt, Irvington, N. J.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wiegman & Co., E. M., 1908 Benton, St. Louis, Mo.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Accurate Molding Corp., 20 Morton, Brooklyn, N. Y.
Adler Mfg. Co., Louisville, Ky.
Adler Royal. See Adler Mfg. Co.
Ampere. See Donohue Lumber Co.
Art Woodworking Co., Inc., 1035 Seattle Blvd., Seattle, Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Blackhawk Furniture Co., Rockford, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Carlon. See Art Woodworking Co.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cary Cabinet Corp., 1427 N. 15th, St. Louis Mo.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Chickasaw Furniture Mfg. Co., Memphis, Tenn.
Conrades Mfg. Co., 1942 N. Second, St. Louis, Mo.
Conner Furniture Co., New Albany, Ind.
Continental Radio Corp., East Pontiac, Extended, Fort Wayne, Ind.
Corbett Cabinet Mfg. Co., St. Mary's, Pa.
Cory Cabinet Corp., Springfield, Mo.
Deiker Co., Geo., Henderson, Ky.
Ebert Furniture Co., 225 W. 34th, New York, N. Y.
Efein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5044 Grand Central Terminal Bldg., New York, N. Y.
Excel Phonograph Mfg. Co., 400 W. Erie, Chicago, Ill.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Federal Wood Products Corp., 206 Lexington Ave., New York, N. Y.
Findlay Mfg. Co., Metropolitan & Morgan Aves., Brooklyn.
Furnas Furniture Co., 139 East, Indianapolis, Ind.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Hubbell, H. L., 59 Market Ave., N. W., Grand Rapids.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
Karpen. See Studner Bros.
Kiel Furniture Co., 32nd and Center Sts., Milwaukee, Wis (Radio Table).
King Mfg. Corp., 254 Rano, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.

Knoxville Table & Chair Co., Knoxville, Tenn.
National Cabinet Co., New Philadelphia, O.
New England Box Co., Greenfield, Mass.
Ohio Valley Cabinet Co., Wheeling (Warwood), W. Va.
Oneida Cabinet Corp., Oneida, N. Y.
Ottawa Furniture Co., Holland, Mich.
Phono-End-Table. See Continental Radio Corp.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.
Radio Cabinet Mfg. Corp., Furniture Mart, Chicago, Ill.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pillin Lumber Co., Swanton, O.
Radio Master Corp., Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Showers Bros. Co., Bloomington, Ind.
Signal Elec. Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Starr Piano Co., Richmond, Ind.
Stettner Phonograph Corp., 669 Kent Ave., Brooklyn, N. Y.
Studner Bros., 67 W. 44th, New York, N. Y.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
West Box Co., 235 Liberty, Springfield, Mass.
Wood Cabinet Corp., 196 Lexington Ave., New York, N. Y.

CABLE ARMORING MACHINES. See Wire Manufacturing Machines

CABLE TEST SETS. See Instruments, Portable and Switchboard.

CABLING MACHINES. See Wire Manufacturing Machines

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington.
Cleveland Container Co., 10619 Berea Rd., Cleveland, O.
Fibre Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., 173 Lafayette, New York, N.Y.
Phoenix Glass Co., Monaca, Pa.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibre Products Co.

CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.

CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.

CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Becker Bros. Elect. Corp., 23 N. Jefferson, Chicago, Ill.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Leasing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Orstip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.
White Flame. See National Carbon Co.

CARTONS. See Boxes and Wrappers.

CASEIN PLASTICS. See Molded Insulation.

CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Brumberger Co., 252 Pearl, New York, N. Y.
Grand Sheet Metal Wks., 176 Grand, New York, N. Y.
Karp Metal Products Co., 129 30th, Brooklyn.

CASES, Flashlight

Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.

CASTINGS, Aluminum. See Castings, Aluminum. Also Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Bergen Point Brass Foundry, Bayonne, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohm Aluminum & Brass Corp., Detroit, Mich.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Monarch Aluminum Ware Co., 9301 Detroit Ave., Cleveland.
National Bronze & Aluminum Foundry Co., 88th & Lake, Cleveland O.
Quality Aluminum Casting Co., Waukesha, Wis.
Tenual. See National Bronze & Aluminum Foundry Co.
United Metal Mfg. Co., Inc., 23 Shipping, Norwich, Conn.
Veco Mfg. Co., South Norwalk, Conn.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass
Barnard Foundry Co., 9 Roseland, Springfield, Mass.
Bergen Point Brass Foundry, Bayonne, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bohn Aluminum & Brass Corp., Detroit.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Hardware Foundry Co., 209 W. Randolph, Chicago.

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Davis & Zuckerman, 514 E. 11th, New York, N. Y.
Delta Star Electric Co., 2437 Fulton, Chicago, Ill.
Dick Bros., Inc., Reading, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Faries Mfg. Co. Decatur, Ill.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Harsch, John, Bronze & Foundry Co., 11612 Madison Ave., Cleveland, O.
Johnson Bronze Co., New Castle, Pa.
McGill Metal Co., Valparaiso, Ind.
National Bronze & Aluminum Foundry Co., 88th & Lexy, Cleveland, O.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave Cincinnati, O.
Rabun Bronze Foundry, 617 West Belgrave, Huntington Park, Cal.
Sterling Art Metal Wks., 40 Purvis, Long Island City, N. Y.
Tennal. See National Bronze & Aluminum Foundry Co.
United Metal Mfg. Co., Inc., 25 Shipping, Norwich, Conn

CASTINGS, Die
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Alemite Die-Casting & Mfg. Co., Woodstock, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Aluminum Industries, Inc., 2436 Beekman, Cincinnati, O
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
American Die Casting Co., 2040 Dominick, Chicago, Ill
Badger Die Casting Co., 155 Buffalo, Milwaukee, Wis.
Barnhardt Bros. & Spindler, Monroe & Throop St., Chicago.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Franklin Die Casting Corp., 826 Gifford, Syracuse, N. Y.
Illinois Die Castings Co., 551 W. Congress, Chicago, Ill.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., 146 Munson, New Haven Conn.
Paragon Die Casting Co., 2701 N. Crawford Ave., Chicago.
Permite. See Aluminum Industries, Inc.
Phoenix Die Castings Co., 21 Illinois, Buffalo, N. Y.
Pittsburgh Die Casting Co., 7508 Ardmore, Swissvale, Pa.
Precision Die Casting Corp., Syracuse, N. Y.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.
Twin City Die Castings Co., Talmadge and 33rd Aves., S. E., Minneapolis, Minn. (White Metal).

CASTINGS, Gray Iron
American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
Berks Foundry & Mfg. Co., West Hamberg, Pa.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Bridgeport Castings Co., 250 North Ave., Bridgeport, Conn.
Chicago Hardware Foundry Co., 209 W. Randolph, Chicago.
Dick Bros., Inc., Reading, Pa.
Fairmount Foundry, Inc., Third & Westmoreland Sts., Philadelphia, Pa.
Farquhar Co., Ltd., A. B., York, Pa.
Forest City-Walworth Run Fuondries Co., 2500 W. 27th, Cleveland, O.
Gray Iron Foundry Co., Reading, Pa.
Laytham & Son, Co., Wm. P., Market & E. 34th, Paterson, N. J.
Milwaukee Grey Iron Foundry Co., 3910 Mitchell, Milwaukee, Wis.
North Lebanon Foundry Co., Second & Canal, Lebanon, Pa.
North Wales Mach. Foundry Co., North Wales, Pa.
Products Machine Co., Bridgeport, Conn.
Sark Iron Foundry, L., 257 Wilson Ave., Newark, N. J.
Snead & Co. Pine St., Jersey City, N. J.
Union Mfg. Co., New Britain, Conn.
Western Foundry Co., Kedzie Ave. at 36th, Chicago, Ill.

CASTINGS, Malleable Iron
Eastern Malleable Iron Co., Naugatuck, Conn.
Southern Malleable Iron Co., 21st & Bond Ave., East St. Louis, Ill.
St. Louis Malleable Castings Co., 7701 N. Conduit Ave., St. Louis, Mo.

CASTINGS, Steel
Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark.
Northwestern Steel & Iron Corp., 2907 Fourth, S. E., Minneapolis, Minn.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Procian. See Northwestern Steel & Iron Corp.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J

CEMENT, Commutator
Ancheriute. See Technical Products Co.
Commutator Companion. See Withington Div. of Marmot Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Fixkwick. See Technical Products Co.
Ideal Commutator Dresser Co., 1839 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
Withington Div. of Marmot Co., 50 Thayer, Boston, Mass.

CEMENT, Liquid Porcelain
Ancheriute. See Technical Products Co.
Fire Lute. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Patch-O-Namel. See Technical Products Co.
Repairet Mfg. Co., Milwaukee, Wis.

Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Technical Products Co., Pittsburgh, Pa.
Thermold. See Technical Products Co.

CHAIN, Chandelier (Fancy). See Crystals, Chandelier.

CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture
Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Chase Brass & Copper Co.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.

CHAIN, Power Transmission
Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks. Sales Co., Norfolk Downs, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Renold Boston. See Boston Gear Wks.
Union Chain & Mfg. Co., Sandusky, O.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket
American Ball Chain Works, 12 Wooster St., New York.
Read Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.

CHANDELIER BEADS. See Crystals, Chandelier.

CHANDELIER CRYSTALS. See Crystals, Chandelier.

CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet
Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1822 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wahada Ave., St. Louis, Mo.
Scintilla Magneto Co., Inc., Sidney, N. Y.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Electric Co., 4321 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery
Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electrex. See Goodyear Chemical Co., Inc.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Bd. and Big Four R. R., Cincinnati, O.
Goodyear Chemical Co., Inc., 20 W. 22nd, New York, N. Y.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Lightning Co., St. Paul, Minn.
Merrimac Chemical Co., 148 State, Boston, Mass.
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltah. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration
Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic
J & H Elec. Co., 200 Richmond, Providence, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS
Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 282 A, Boston, Mass
Anderson & Co., C. J., 212 W. Austin Blvd., Chicago, Ill.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee. (Mercury Type).
Domestic Elec. Co., Kent, O.
General Electric Co., Section W-234, Bridgeport, Conn.
Hart & Hegeman Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hartman Electrical Mfg. Co., 31 E. Fifth, Mansfield, Ohio.
High Tension Elecl. Specialty Co., 500 Washington, Abington, Mass.
Hitesco. See High Tension Elecl. Specialty Co.
H. & H. See Hart & Hegeman Div.
Inducto-therm. See Allen-Bradley Co
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 330 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 204 Rawson, Long Island City, N. Y
Time-O-Stat Controls Co., Cramblett Engineering Div. 236, Milwaukee Ave., Milwaukee, Wis.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa

CIRCUIT TESTERS. See Testers, Fuse and Circuit

CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal
Oakite Products, Inc., 26 Thames, New York, N. Y.

CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug
Gray Bros. Co., Piano, Ill.

CLOCK SWITCHES. See Switches, Time.

CLOTH GEARS. See Gears and Pinions, Composition.

CLOTH LOUD SPEAKER DIAPHRAGM. See Cloth, Untreated.

CLOTH RADIO GRILL. See Cloth, Untreated.

CLOTH, Untreated
Boyle & Co., John, 112 Duane, New York, N. Y.
Canvas, "Aeroplane Cloth," Cotton Duck, Drill, Diaphragm Cloth, Grill Fabrics, etc
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pindall Fabrics Corp., 200 Madison Ave., New York, N. Y. (Grill Cloth).

CLOTH AND PAPER, Insulating

Cloth, Insulated	See C					
Paper, Insulated	See P					
Fibre Paper (Fish Paper)	See P					
Press Board (Fuller Board)	See B					
Silk	See S					
Acme Wire Co., New Haven, Conn	C	S	P			
Armco. See Rogers Paper Mfg. Co.						
Armatite. See Mica Insulator Co.						
Behr-Manning Corp., Troy, N. Y.			P			
Brand & Co., Wm., 268 4th Ave., New York			P			
Campbellite. See National Vulcanized.						
Carboloid Products Corp., 15 Park Row, New York, N. Y.	C		P			
Case Brothers, Inc., Highland, Park, Conn.			P			B
Case Mfg. Co., Unionville, Conn.			P			
Case & Risley Press Paper Co., Oneco, Conn.						
Celoron Co., Bridgeport Pa.			P	F	B	
C-F. See National Vulcanized Fibre Co.						
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.	C					
Columbian Rope Co., Auburn, N. Y.			P			
Continental-Diamond Fibre Co., Bridgeport, Pa.			P			
De Jongs & Co., Louis, 69 Duane, New York, N. Y. (Condenser)			P			
Dexstar. See Dexter & Sons.						
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)						
Dielectric Mfg. Co., St. Louis, Mo.	C	S	P			B
Electrite. See West Virginia Pulp & Paper Co.						
Fyberoid. See Wilmington Fibre Specialty Co.						
General Electric Co., Merchandise Dept., Bridgeport, Conn.	C		P			
chandise Dept., Bridgeport, Conn.	C		P			
Hartford City Paper Co., Hartford City, Ind. (Glassine Condenser Tissue).						
Hewitt & Bros., C. B., 16 Ferry, New York	C		P			
Hi-Tex See Stevens Paper Mills.						
Hollingsworth & Vose Co., 333 Washington, Boston, Mass.			P			
Incella. See Tarentum Paper Mills Co.						
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.			P			
Irvington Varnish & Insulator Co., Irvington, N. J.	C	S	P			
Manning Paper Co., H. A., Troy, N. Y.						B
Mica Insulator Co., 200 Varick, New York	C	S	P			B
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.			P			
National Vulcanized Fibre Co., Wilmington, Del.					F	
New Jersey Wood Finishing Co., Woodbridge, N. J.	C					
Ohmoid. See Wilmington Fibre Specialty Co.						
Old Hick. See Hewitt & Bros., C. B.						
Peerless. See National Vulcanized Fibre Co.						
Riegels. See Warren Mfg. Co.						
Rogers Fibre Co., 210 Lincoln, Boston, Mass.					F	
Rogers Paper Mfg. Co., So. Manchester, Conn.						B
Schweitzer, Inc., Peter J., 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)						
Sico. See Standard Insulation Co.						
Standard Insulation Co., East Rutherford, N. J.	C	S	P			
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varnished Hard Fibreboard)						B
Sterlite. See Sterling Firebrand Co.						
Stevens Paper Mills, Windsor, Conn.						B
Tarentum Paper Mills Co., Tarentum, Pa.			P			
Turbolite. See Brand & Co., Wm.						
Union Mills Paper Mfg. Co., New Hope, Pa.			P			
Warren Mfg. Co., 343 Madison Ave., New York, N. Y.			P			
West Virginia Pulp & Paper Co., 230 Park Ave., New York						B
Wilmington Fibre Specialty Co., Wilmington, Del.			P			

CLUTCHES, Magnetic
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis

COIL (Coils).
Armature and Field. See Coils, Finished.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.

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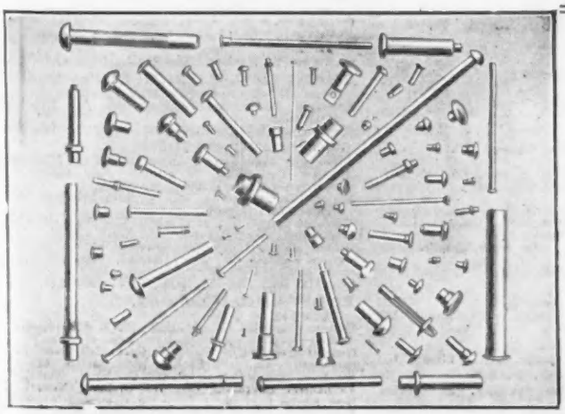

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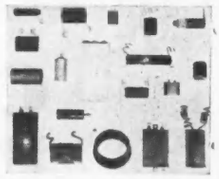

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Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature and Field.
Tamping Tools. See Tools, Coil Tamping.
Taping Machines. See Taping Machines, Coil.
Testers. See Testers, Coil; also Test Benches, Armature
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire

COILS, Finished
Armature, Field, Electromagnet and Induction Coils
Acme Products Co., Boston, Mass.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York.
A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Concourse Electric Co., 294 E. 137th, New York, N. Y.
Coto Coil Div. of Universal Winding Co., Providence, R. I.
Ditmar Elec. Co., Brookline, Mass.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Valve Mfg. Co., 68 Murray, New York, N. Y.
Electrical Coil Winding Co., 2735 Saunders, Camden
Electrical Products Mfg. Co., Providence, R. I.
Fredericks Co., H. M., Lock Haven, Pa.
Globe Technolian Corp., Reading, Mass.
Herald Electric Co., 29 East End Ave., New York, N. Y.
Inca Mfg. Co., Fort Wayne, Ind.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
National Elec. Corp., 226 High, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Polymet Mfg. Co., 829 E. 134th St., New York, N. Y.
Reisner Mfg. Co., W. H., Hagerstown, Md.
Robertson-Davis Co., 361 W Superior, Chicago, Ill.
Robertson, Leo F., Inc., 532 West 22nd St., New York.
Rome Wire Co. (Div of General Cable Corp.), Rome, N. Y.
States Co., 19 New Park Ave., Hartford, Conn.
Stunz & Barron, 210 E. Pratt, Baltimore, Md.
Toledo Standard Commutator Co. 2242 Bmead Ave., Toledo, O.
Varley Duplex Magnet Co., 15 Exchange Place, Jersey City, N. J. (Electromagnetic only).
Wells Mfg. Co., Fond du Lac, Wis.

COMMUTATOR
Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS
Cameron Electric Mfg. Co., Ansonia, Conn.
Cleveland Commutator Co., 1882 E. 55th, Cleveland, O.
Derby Commutator Co., Derby, Conn.
Electric Materials Co., North East, Pa.
Eureka Metal Products Corp., 91 Clay, North East, Pa.
Homer Commutator Co., 4748 Hough Ave., Cleveland.
Toledo Standard Commutator Co., Toledo, O.
COMMUTATOR BRUSHES. See Brushes, Commutator
COMPOSITION PULLEYS. See Pulleys, Composition.

COMPOUNDS, Commutator
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Armstrong. See Elec. Power Maintenance.
Commutator. See Warren Lubricant Co.
Cramolin, Inc., 25 W. 43rd St., New York, N. Y.
Dixon Crucible Co., Jos., Jersey City, N. J.
Doe & Co., Walter S., Kent, Ohio.
Gales. See McLennan & Co.
Goldmark Co., James, 83 Warren, New York, N. Y.
Kester Solder Co., 4212 Wrightwood Ave., Chicago, Ill.
McLennan & Co., K., 1751 West 35th, Chicago.
Perfection. See Warren Lubricant Co.
Sanderson. See Warren Lubricant Co.
Spermo. See Warren Lubricant Co.
Trotters. See Goldmark Co., James.
Warren Lubricant Co., 22 Maurice, Buffalo, N. Y.
COMPOUNDS, Sealing. See Wax and Compounds.

CONDENSER UNITS, Refrigerator
Bush Mfg. Co., Hartford, Conn.
McCord Radiator & Mfg. Co., Riovelle & E. Grand Ave., Detroit, Mich.
Rome-Turney Radiator Co., Rome, N. Y.

CONDENSER, Electric
Sevison Magneto Engineering Co., 397 Phillips, Toledo, O.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper.

CONNECTORS, Pin-Plug
Klieg Bros. Universal Electric Stage Ltg. Co., 321 W 50th, New York, N. Y.

CONNECTORS, Wire
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill. (Solderless-Tapeless).
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor
Aclinestor. See Sundh Elec. Co.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 858 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond Elecl. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
Dinkey. See Elec. Controller & Mfg. Co.
Dunco. See Struthers Dunn, Inc.
E C & M Youngstown. See Electric Controller & Mfg. Co.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
Hercules. See Union Elec. Mfg. Co.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 515 Greenwich, New York.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Speed Control Corp., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd., Chicago, Ill.
Resisto. See Allen-Bradley Co.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md.
Square D Co., 6060 Rivard, Detroit, Mich.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Uneleo. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., 934 Juneau Ave., Milwaukee, Wis.
Ward Leonard Elec. Co., 31 South, Mount Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. E. See Westinghouse Elec. & Mfg. Co.
COPPER See Brass, Bronze and Copper; also Castings
COPPER TUBING. See Tubing, Brass and Copper
CORD TIPS. See Tips, Cord.
CORD, Tinsel. See Tinsel Cord & Thread.

CORDS, Extension
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.

CORES, RESISTANCE COIL (Lava)
American Lava Corp., 1425 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)
American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 1 Central Ave., West Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Firelite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitreosil. See Thermal Syndicate.
Woolley, Inc., W. Douglas, East Liverpool, O.
COTTON DUCK. See Cloth, Untreated.
COTTON SLEEVING. See Tape, Cotton.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett Hayward Co., Baltimore, Md.
Bond Co., Charles, 617 Arch, Philadelphia, Pa.
Brown Engineering Co., 123 N. Third, Reading, Pa.
Falk Corp., Milwaukee, Wis.
Delbee Rubber Co., Syracuse, N. Y.
Francke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Grundy. See Bond Co.
Kanti Lever. See Brown Engineering Co.
Krene-Seebek Die Casting & Mfg. Co., 2335 W. 47th, Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 325 W. Ohio, Chicago, Ill.
Mather. See Bond Co.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 5 Halsey, Newark, N. J.
Webster Mfg. Co., 1856 N. Kostner Ave., Chicago, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.
COVERING MACHINES, WIRE. See Wire Manufacturing Machines
CRUCIBLES, Porcelain. See Porcelain.

CUPS, Grease
Bowen Products Corp., Auburn, New York.
Gits Bros. Mfg. Co., 1940 S. Kilbourn Ave., Chicago, Ill.
Lunkenheimer Co., Cincinnati, Ohio.

CUPS, Oil
Gits Bros. Mfg. Co., 1940 S. Kilbourn Ave., Chicago, Ill.
CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier
Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Fuulits. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschberg, Shutz & Co., 268 4th Ave., New York, N. Y.
(Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.
CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA
Meyercord Co., Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

DIALS
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled
Whittier Co., Horace B., Pequabuck, Conn.
DIAPHRAGM, Cloth. See Cloth, Untreated.
DIE CASTINGS. See Castings, Die.

DIE CASTING MACHINES
Allied Die Casting Corp., Long Island City, N. Y.
Madison-Kipp Corp., Madison, Wisc.
DIE MAKERS. See Dies, Die Makers.

DIE SETS
Baumbach Mfg. Co., 1810 Kilbourn Ave., Chicago, Ill.
Danly Machine Specialties, Inc., 2104 S. 52nd Ave., Chicago, Ill.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Caldbeck Tool & Mfg. Co., 307 East Third, Des Moines, Iowa.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Madison-Kipp Corp., 211 Waubesa, Madison, Wis.
Mareck & Nebel, 255 Greenwich, New York, N. Y.
Plymouth Mfg. Co., 2148 Walnut, Chicago, Ill.

DIMMER, Theatre
Ward Leonard Elec. Co., 31 South, Mount Vernon, N. Y.

DISCS, Armature
Steel Discs, Laminations, and Segments for Motors and Transformers.
American Stamping Co., 978 E. 64th, Cleveland, O.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland.
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Johnson, H. D., 170 Mahncke Court, San Antonio, Texas.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.
Niagara Machine & Tool Wks., 637 Northland, Buffalo.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Willor Mfg. Corp., 117 Mercer, New York, N. Y.
DRAWING MACHINES, WIRE. See Wire Drawing Mach.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. Schenectady.
EBONITE. See Rubber, Hard.
ELECTROLYTES. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.

ELECTRODES FOR GAS SIGNS
American Neon Sign Corp., 549 W. 132nd St., New York.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Machlett & Son, 50 William, Long Island City, N. Y.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
Ohio Neon Lamp Corp., Highland Ave., (Norwood) Cincinnati, O. (Housings)
Q. R. S. De Vry Corp., 333 N. Michigan Ave., Chicago.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)
(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper & Hartley, Inc., 335 Chandler, Worcester, Mass

ENGRAVING MACHINES
Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
(Tube Base Branders)
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Preis & Co., Inc., H. P. Newark, N. J.
Schmidt, Inc., Geo. T., 4100 Ravenswood Ave., Chicago, Ill.

ENGRAVING, Radio Panel
Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
General Fabricating Co., 165 Greenwich, New York, N. Y.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Mechanical Engraving Co., 120 Orchard, Newark, N. J.
New England Products Co., 282 Greenwich, New York.
Preis & Co., Inc., H. P., 227 Fulton, New York, N. Y.

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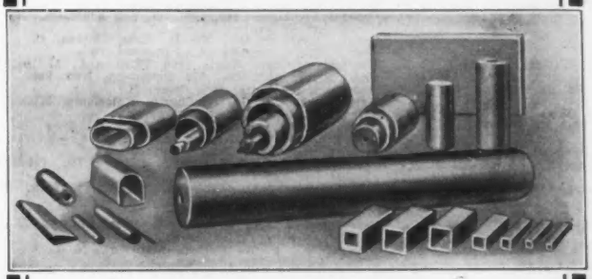

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Schmidt, Inc., Geo. T., 4102 Ravenswood Ave., Chicago, Ill. (Tube Base Branders).
Schwenke Machine Engraving Co., 2096 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati
Wright Radio Co., 114 Exchange, Rockland, Mass.

EYELETS
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn.
Waterbury Button & Moulding Co., 835 S. Main, Waterbury, Conn.

FABRIC, Radio Grill. See Cloth, Untreated.
FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.

FEET, Felt
Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.
Mattatuck Mfg. Co., Waterbury, Conn.

FELT
American Felt & Cutting Co., 609 W. Lake, Chicago, Ill.
American Felt Co., 315 Fourth Ave., New York, N. Y.
Hoosh Felt Co., 469 18th, Brooklyn, N. Y.
Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4029 Ogden Ave., Chicago, Ill.

FERRULES
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)
Container Corp. of America, 111 W. Washington, Dept. 36, Chicago, Ill.
Mid-West Box Co., 111 W. Washington, Chicago.
Sefton Mfg. Corp., 50 E. Madison, Chicago, Ill.

FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol
Moisture Proof; Sheet, Rod, Tubes.
Aico. See American Insulator Corp.
Amerine. See American Insulator Corp.
Armite. See Spaulding Fibre Co.
Bakelite-Dilecto. See Continental Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Electrical Insulation Corp., 308 W. Washington, Chicago, Ill.
Fibroc Insulation Co., 245 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4626 Spring Grove Ave., Cincinnati, O.
Franklin Fibre Specialty Co., Wilmington, Del.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Tonawanda, N. Y.
Synthane Corp., Oaks, Pa.
Textolite. See Electrical Insulation Corp.
Vul-Cot. See National Vulcanized Fibre Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized
Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.
Conite. See Continental-Diamond Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Box 970M, Wilmington, Del.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Pantasote Co.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., Wilmington, Del.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Iten Fibre Co., 8402 Bower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmold. See Wilmington Fibre Specialty Co.
Pantasote Co., Inc., 250 Park Ave., New York, N. Y.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 216 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Tweenten Fibre Co., 111 S. Jefferson, Chicago, Ill.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Continental-Diamond Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Cohn, Sigmund, 44 Gold, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Gilby Wire Co., Riverside Ave., Newark, N. J.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J.
Radio Products Corp., Stenack Trust Bldg., Hoboken, N. J.
Suter & Nuetzi, 3709½ Lisbon Ave., Milwaukee, Wis.
Volkmer Radio Products Corp., 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.

FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See B
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps ..... H
American Chain Co., Bridgeport, Conn. (Loops and Rings.) ..... B . . . .
American Ring Co., Waterbury, Conn. (Candle.) . . . S . .
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. ..... B I . . .
Arco. See American Ring Co.
Arrow Electric Division of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... S . .
Artoloid. See Great Eastern Brass Wks., Inc.
Art Metal Co., 3721 Dayton, Cleveland, O. ..... H
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit. . B . . . .
Belmet. See B. & L. Metal Stamping Co.
Bloch Bros., 88 Walker, New York ..... B . . . .
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. B . . . .
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) ..... B I . . .
B. & L. Metal Stamping Co., 250 Moore, Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) ..... B I . . H
Cambridge Brass Co., Cambridge, Mass. ..... B . . . .
Chase Brass & Copper Co., Waterbury, Conn. B . . S . .
Chatham Metal Spinning & Stamping Corp., 128 Mott, New York, N. Y. ..... B I . . .
Cleanezy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. ..... B . . S . .
Crescent Brass Mfg. Co., Reading, Pa. ..... B . . . .
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. ..... S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) ..... I . . .
Dunlap Co., John, Carnegie, Pa. ..... S . .
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. ..... B . . . .
Eureka Tin Ware Mfg. Co., 135 W. 20th, New York, N. Y. ..... S . .
E-Z Up. See Plume & Atwood Mfg. Co.
Feries Mfg. Co., Decatur, Ill. ..... B I S H
Fixturelite Mfg. Co., 468 W. Broadway, New York, N. Y. ..... B . . . H
Flaherty Co., M. E., 28 S. Clinton, Chicago. . . I . . .
Fralick Co., S. R., 15 S. Clinton, Chicago. . . I . . .
Franklin Brass Foundry Co., Reading, Pa. . . . B . . . .
Friedley-Voshardt Co., Chicago. ..... B . . . .
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O. ..... I . . .
Great Eastern Brass Wks., Inc., 183 Grand, New York, N. Y. (Spindles).
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... S . .
Isco. See Fixturelite Mfg. Co.
Jiffy. See White Mfg. Co., J. H.
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Liberty Brass Turning Co., 88 Walker, New York, N. Y. ..... I . . .
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. ..... B I . . .
Liberty Machine Co., Wauwatosa, Wis. ..... B I . . .
Light Metal Stamping Co., 310 13th St., West New York, N. J. ..... S . .
L & K Mfg. Co., 440 Adelphi, Brooklyn, N. Y. . . . . H
L. & W. Brass Wks., 361 W. Superior, Chicago. B . . . .
Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. ..... I . . .
Meta. Products Co., 210 Canal, New York. . . . B . . . .
Metro Iron Ornament Co., 191 Christie, New York, N. Y. ..... I . . .
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. ..... B . . . .
Midwest Elec. Co., 1639 Walnut, Chicago, Ill. . . I . . .
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. ..... B . . . . .
Michell-Vance Co., 70 Washington, Brooklyn, N. Y. ..... S . .
Monarch. See Perfecelite Co.
Murlin Mfg. Co., Philadelphia, Pa. ..... B I . . .
National Electric Products Corp., Pittsburgh, Pa. (Studs.) ..... I . . .
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. ..... H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 565 Broadway, New York, N. Y. ..... B . . . .
Nobolt. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. ..... I . . .
Onit. See Perfecelite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. B . . S . .
Perfecelite Co., 1457 E. 40th, Cleveland. . . . . S . .
Pittsburgh Valve & Fittings Co., Barberton, O. . . I . . .
Plume & Atwood Mfg. Co., Waterbury, Conn. B . . S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Products Machine Co., Bridgeport, Conn. ..... B . . . .
Reading Brass Co., 141 Schiller, Reading, Pa. B I . . .
Ribaysen Mfg. Co., J., 953 W. Lake, Chicago, Ill. B . . . .
Rozalo Mfg. Co., 200 Hudson, New York. . . . B . . . H
Sandow Tool Co., 1440 Bway, New York, N. Y. . . . S . .
Scovill Mfg. Co., Waterbury, Conn. ..... B I . . .
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. ..... S . .
Standard Metal Spinning Co., 128 Mott, New York, N. Y. ..... B . . . .
Star. See Perfecelite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. ..... I . . .
Steele & Johnson Mfg. Co., Waterbury, Conn. B . . S . .

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CLEVELAND 1302-4-6 Ontario St.
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Stembridge & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) ..... B . . . .
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York. . . . . I . . .
Une. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. ..... B . . . .
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B . . . .
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. ..... B . . . .
Walden Tool & Metal Mfg. Co., New Haven Conn. ..... .
Wameco. See Waterbury Metal Wares Co.
Waterbury Metal Wares Co., Waterbury, Conn. . . . S . .
Weber Brass Co., Whitney Power Block, Cleveland, O. ..... B . . . .
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 79 Madison Ave., New York, N. Y. ..... B . . S . .
Wilhite Machine Wks., 1345 S. Hope, Los Angeles, Cal. ..... B . . . .

FLASHERS, Sign
Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
Ajax. See Reynolds Spring Co.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 280 Guttenberg, San Francisco
Commercial Elec. Co., 1263 E. Grant, Portland, Ore.
Consolidated Elec. Sign Corp., Opalume Div., 99 West Main, Battle Creek, Mich.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Diamond. See General Appliance Corp.
Dominie. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electric Signal Corp., 406 Fourth Ave., Seattle, Wash.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Harrington-Reaberg Corp., 1708 Third Ave., Moline, Ill.
Hornt Signal Mfg. Co., 516 Greenwich, New York, N. Y.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark. See Betts & Betts Corp.
Kontroler. See Leland Electric Co.
Leland Electric Co., Dayton, O.
Mercury. See Betts, Inc., James H.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 520 Broadway, New York, N. Y. (Sockets and Plugs.)
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2650 W. Congress, Chicago, Ill.
Reynolds Spring Co., Jackson, Mich.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Ryan. See Phoenix Products Co.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.

FLEXIBLE SHAFTING
Binghamton Flexible Shaft Co., 239 Water, Binghamton, N. Y.
Chicago Flexible Shaft Co., 5600 W. Roosevelt Rd., Chicago, Ill.
Haskins Co., R. G., 4636 W. Fulton, Chicago, Ill.
Stow Mfg. Co., 443 State, Binghamton, N. Y.
Strand & Co., N. A., 500 N. Lincoln, Chicago, Ill.

FOIL, Tin. See Tin Foil.

FORGINGS, Non-Ferrous
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire
Forms and Frames for Shade Holders and Shades; Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.

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Electro Weld Co., 70 Munroe, Lynn, Mass.
Fischer Spring Co., Chas., 218 Kent Ave., Brooklyn, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Manhattan Wire Products Co., 258 First Ave., New York
Mattatuck Mfg. Co., Waterbury, Conn.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.
FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS

Sherman Mfg. Co., H. B., Battle Creek, Mich.
Waterbury Brass Goods Co., Waterbury, Conn.
FUSE PLUG SCREW SHELLS. See Shells, Screw Socket.
FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

KEY

Cartridge ..... See C
Plug ..... See P
Non-Refillable ..... See N
Refillable ..... See R
Open Link ..... See O
Fuse Wire ..... See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... P .....
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa. ..... O
Arklees. See Economy Fuse Mfg. Co.
Automatic Elec. Iron & Fuse Co., 315 S. American, Philadelphia, Pa. ..... P .....
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis ..... C P N R O
Chase-Shawmut Co., Newburyport, Mass... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colortop. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C .. N R ..
Commercial Enclosed Fuse Co., 1317 Willow Ave., Hoboken, N. J. ..... C P N .. ..
Cota Bros. Mfg. Co., 182 W. Lake, Chicago C P .. R ..
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hedgkiss, Pittsburgh ..... C .... R ..
D. & W. See Graybar Electric Co.
Eagle Electric Mfg. Co., Inc., 49 Hall, Brooklyn, N. Y. ..... P .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... C P N R ..
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va.. C P N R ..
Elliott Electric Co., Shreveport, La. .....
Gem. See Jefferson Elec. Co.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... C P N R ..
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C .....
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. ..... R ..
H. & H. See Hart & Hegeman.
Hudson Wire Co., Ossining, N. Y. ..... O
Jefferson Electric Co., 1505 W. 15th, Chicago, Ill. ..... C P N R O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y. ..... C P N .. O
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. (Low Capacity, Glass Enclosed, .025 to 2 Amp.) .....
Monarch Fuse Co., 116 E. First, Jamestown, N. Y. ..... C .. N R ..
National. See Economy Fuse & Mfg. Co.
Neark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y ..... C P .. R ..
Platt Bros. & Co., Waterbury, Conn. ..... O
Powell, F. W., 119 W. Ohio, Pittsburgh.. .. P .. R ..
Rec-Nu-It Elec. Co., New Bedford, Mass.. C P .. R ..
Rochester Re-Pill Fuse Co., 402 Cottage, Rochester, N. Y. ..... C .... R ..
Royal Elec. Co., Chelsea Station, Boston.. .. P N .. ..
Seco. See U. S. Electric Co.
Shawmut. See Chase-Shawmut Co.
Simplicity. See Cote Bros. Mfg. Co.
Six-In-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P .. R ..
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ..... C P N R ..
Union. See Jefferson Elec. Co.
U.S. Electric Co., 20 Chambers, Trenton, N.J... P .....

GALVANIZING

Cattle & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.
GALVANOMETERS. See Instruments, Laboratory Standard.

GAS, Inert

Helium Co., Louisville, Ky.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Weber, Alfred, 5 Union Square, New York, N. Y.

GAS SIGN ELECTRODES. See Electrodes for Gas Signs

GASKETS, Rubber

Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.
GAUZE BRUSHES, Wire. See Brushes, Commutator.
GEARS, Fibre. See Gears and Pinions, Composition.

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Cullinan Wheel Co., 1346 Altgild, Chicago, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Farrell-Birmingham Co., 344 Vielean, Buffalo, N. Y.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Jones Fdy & Machine Co., W. A., Chicago, Ill.
Lewellen Mfg. Co., Columbus, Ind.
Lipe, W. C., Syracuse, N. Y.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.

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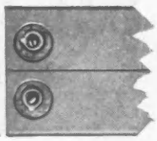

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Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Colburn Gear & Mfg. Co. (Norfolk Downs), Quincy, Mass.
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Continental Diamond Fibre Co., Bridgeport, Conn.
Delaware Hard Fibre Co., Box 570M Wilmington, Del
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago.
Franklin Fibre Specialty Co., Wilmington, Del
General Electric Co., Schenectady, N. Y.
Gedart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co
National Vulcanized Fibre Co., Wilmington, Del
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear & Machine Co., 1390 E. 40th, Cleveland, Ohio.
Strasnaba Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa

GEARS AND PINIONS, Iron and Steel

Chicago Gear Wks., 709 W. Jackson Blvd., Chicago, Ill.
Earle Gear & Machine Co., Wayne Junction, Philadelphia.
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave, Boston, Mass
Ohio Gear Co., 1336 E. 179th, Cleveland, Ohio.
Perkins Machine & Gear Co., 126 Circuit Ave., Springfield, Mass.
Pormag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio

GEARS AND PINIONS, Rawhide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Gerdes & Co., 50 Church, New York, N. Y.
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis
GENERATORS, Electroplating. See Plating Generators
GLASS BULBS. See Bulbs, Glass.
GLASS CANDLES. See Candles, Fixture
GLASS LETTERS. See Letters, Sign

GLASS for Electrical Purposes

Canton Glass Co., Marion, Ind.
Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Atlas Glass & Mirror Co., 2315 Ogden Ave., Chicago, Ill.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y. "Equalite."
Beaumont Co., Mooreantown, W. Va.
Bienenfeld Glass Wks., Inc., 1539 Covert, Brooklyn, N. Y.
Chesler & Sons, J., 45 Varick Ave., Brooklyn, N. Y.
Consolidated Lamp & Glass Co., Coraopolis, Pa. "Amelite," "Aurora," "Cora," "Nulite," "Pastelle," "Rosedora," "Shade-O-Tone."
Corning Glass Co., Corning, N. Y. "Aurene," "Calcite." "Eagle Mfg. Co., Wellsburg, W. Va.
Forger & Co., A. H., 2414 E. 58th, Los Angeles, Cal.
Gill Glass Div. of Gill-Virden Co., Amber & Venango Sts., Philadelphia, Pa. "Alliglass," "Gillglo," "Gillway," "Hyperion," "Nova," "Una," "Utilitilite," "Velva."
Gillinder Bros., Inc., Port Jervis, N. Y. "Apollo," "Embroidro," "Celatone."
Gillinder & Sons, Inc., Philadelphia, Pa. "Glassilk," "Persian," "Mellilite," "Micro."
Glass & Mfg. Co., Wellsburg, W. Va.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y. "Alabaster," "Amazon," "Blanco," "Carmia," "Carrara," "Celestialite," "Florentine," "Gletian," "Gletieco," "Opalux," "Polycase," "Silverglow."
Hocking Glass Co., Lancaster, O. "Lumina."
Holophane Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O. "Nuart."
Inland Glass Wks., Inc., 6101 W. 65th, Chicago, Ill. "Snow White," "Inlite," "Alabaster," "Cased," "Crackled," "Etched."
Ivanhoe Division of Miller Co., Cleveland, O. "Clearcut," "Druid," "Genco," "Ivre," "Regiut," "Rozelle," "Sudan," "Trejan," "Veluria," "Yural."
Jeannette Shade & Novelty Co., Jeannette, Pa. "Ardmore," "Tensolite."
Jefferson Glass Co., Follansbee, W. Va. "Moonstone," "Nitro-Glass."
Kopp Glass, Inc., Swissvale, Pa. "Havana," "Nicco," "Delica White."
Macbeth-Evans Glass Co., Charleroi, Pa. "Alba," "Cremax," "Monax," "Thebian," "Lumite," "Galax."
McFaddin & Co., H. G., 38 Warren, New York, N. Y. "Bellova." " Emeralite."
Perfection Glass Co., Star City, W. Va. "Oplex."
Phoenix Glass Co., Monaca, Pa. "Ivory," "Magnolia," "Radiant."

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Rawson & Evans Co., 710 Washington Blvd., Chicago, Ill.
Star Glass Co., Star City, W. Va.
Stelmer, Doran & Rowe, 336 Fourth Ave., Pittsburgh, Pa. "Radax."
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Wells Glass Co., Kokomo, Ind. "Daylite."
Williamsburg Flint Glass Co., 290 Broadway, New York.
Zanesville Mould Co., Zanesville, O.

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Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Liberty Bell Mfg. Co., Minerva, O.
Reiter, G. C., Canton, O.
GRAPHITE BEARINGS. See Bearings, Oil-less.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GRILL CLOTH. See Cloth, Untreated.
GRINDERS, Commutator. See Tools, Commutator Truing.
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.

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American Enamel Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass
Stratton Mfg. Co., Stratton, Maine.
Strombeck-Becker Mfg. Co., Moline, Ill.
Sun Enamel Wks., Leominster, Mass.

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Beckwith Machine Co., 402 Chestnut, Ravenna, O.
Hold-Heet. See Russell Electric Co.
Russell Electric Co., 384 W. Huron, Chicago, Ill.
HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
IMPREGNATING COMPOUNDS. See Wax and Compounds
IMPREGNATING, VACUUM. See Ovens, Industrial.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass
INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

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Elinco. See Electric Indicator Corp.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.
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INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard

Argeo Laboratories, Inc., 150 W. 22nd, New York, N. Y.
Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Grand Central Terminal Bldg., New York, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill
Delta-Star Elec. Co., 2437 Fulton, Chicago, Ill.
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Fahy. See Rubicon Co.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Milvay. See Chicago Apparatus Co.
Onico. See Westinghouse Electric & Mfg. Co.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y
Rubicon Co., 29 N. Sixth, Philadelphia Pa. (Wheatstone Bridges, Galvanometers, Inductance Condensers, Potentiometers, Resistance Boxes, Permeameters.)
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Strobatchy. See Argeo Laboratories, Inc.
Stromberg Electric Co., 223 W. Erie, Chicago, Ill.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 583 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Pocket

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Adbro Mfg. Co., 927 French, Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Beyer Products Co., 197 Grove, Bloomfield, N. J.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
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Lundquist Tool & Mfg. Co., Worcester, Mass.
Milavolt. See Adbro Mfg. Co.
Leadritz Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
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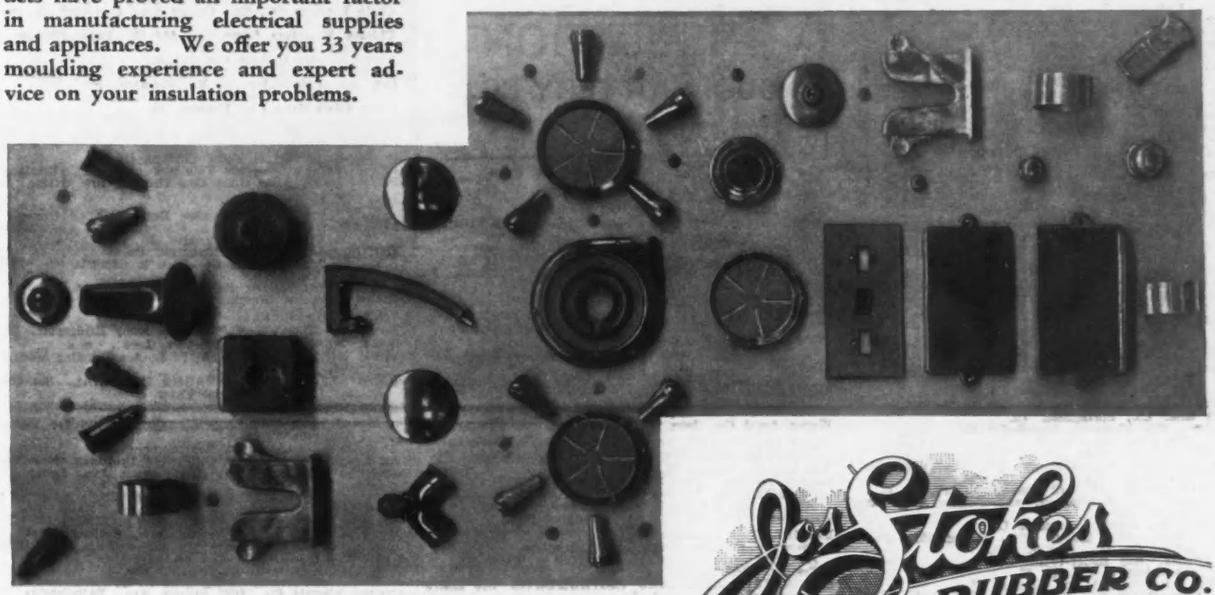

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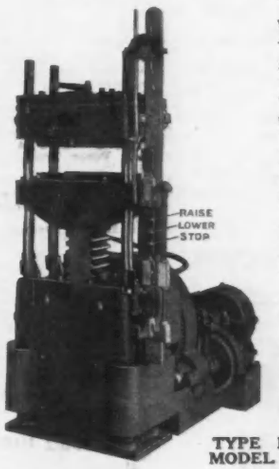

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Esterline-Angus Co., Speedway, Indianapolis, Ind.
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Fisher Cable Test Sets. See Leeds & Northrup.
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Handy. See Weinberg & Co.
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Master. See Jewell Elect. Instrument Co.
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Queen. See Gray Instrument Co.
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Roller-Smith Co., 120 Broadway, New York, N. Y.
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Standco. See Sticht Co., H. H.
States Co., Hartford, Conn.
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Stewart Bros., Ottawa, Ill.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 8?th, Philadelphia, Pa.
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
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Two-in-One. See Stitcht Co., Herman H.
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Utility. See Esterline-Angus Co.
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Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint, Varnish, Lacquer.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

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INSULATION MIXERS
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INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

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Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
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Wilmington Fibre Specialty Co., Wilmington, Del.

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IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

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Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Rodefer Glass Co., Bellaire, O.
Sneath Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

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Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
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Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
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Sapphire Products Co., 51 Chambers, New York, N. Y
Universal. See Oedinger, J. L.
Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.

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Appleton Elec. Co., 1763 Wellington Ave., Chicago, Ill.
Macallen Co., Boston 27, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3230 North Ave., Milwaukee.
White Co., O. C., 15 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

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Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.
LACQUER, ARMATURE. See Paint, Varnish and Lacquer. Metal. See Paint, Varnish and Lacquer.
LAMINATIONS. See Discs, Armature.
LAMP BASES. See Bases, Reading Lamp.
LAMP BULBS (Unfinished). See Bulbs, Glass.
LAMP FILAMENTS. See Filaments, Incandescent Lamp.
LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.
LAMP TESTING PHOTOMETERS. See Photometers, Lamp.

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Hobart Bros. Company, Troy, Ohio. (Test Bench).
South Bend Lathe Works, 425 E. Madison, South Bend, Ind.
Weidenhoff, Joseph, 4351 W. Roosevelt Rd., Chicago, Ill.

LAVA. See Cores, Resistance Coil.

LEAD
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Blatchford Co., E. W., 608 Dearborn, Chicago, Ill.
Columbia Smelting & Refining Wks., 365 West, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago, Ill.
Federated Metals Corp., Woolworth Bldg., New York, N. Y.
Jacobson & Son Co., I. M., 15304 Idaho, Detroit, Mich.
National Lead Co., 111 Broadway, New York, N. Y.
Raymond Lead Co., 735 S. Washtenaw Ave., Chicago, Ill.
Turner Lead Co., East St. Louis, Ill.
United Metals Selling Co., 25 Broadway, New York, N. Y.

LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.
LEADS, FLEXIBLE (Commutator Brush). See Brushes.

LENSES
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B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatal & Sons, J. A., Queens Village, N. Y.
Electric Power Equipment Corp., 412 W. 15th, Philadelphia, Pa.
Elpeco. See Electric Power Equipment Corp.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)

North Light Corp., 30 W. 15th, New York, N. Y.
Popper & Sons, Leo, 147 Franklin, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rochester Glass Products, Inc., 29 N. Water, Rochester, N. Y.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Signs.)
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

LETTERS, Sign
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Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 654 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. P., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
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Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

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Duff-Norton Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

LININGS, Socket
Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.
LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.
LOUD SPEAKER DIAPHRAGMS MATERIAL. See Cloth, Untreated; also Parchment Paper.

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Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
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American Radio Products Corp., 149 Broadway, New York.
American Reproducers Co., 1204 Summit Ave., Jersey City, N. J.
A. R. C. See American Reproducers Co.
Amplion. See Woolf, J. W. & W. L.
Baritone Mfg. Co., 346 Jackson Blvd., Chicago, Ill.
Boudette Mfg. Co., 67 Crescent Ave., Chelsea, Mass.
Brooklyn Metal Stamping Corp., 720 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stanton Ave., Philadelphia, Pa.
Conamic. See Operadio Mfg. Co.
Decatur Mfg. Co., 45 Harman St., Brooklyn, N. Y.
Detroit Reproducers, Inc., Lafayette & Meldrum Sts., Detroit, Mich.
Duo-Lae. See F. & H. Radio Laboratories.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 812 E. 22nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenen Cone Co., 57 Murray, New York, N. Y. (Kit.)
Fidelity Radio Corp., Salt Lake City, Utah.
F. & H. Radio Laboratories, Fargo, N. D.
Globe Technolian Corp., Reading, Mass.
G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jack Horner. See Operadio Mfg. Co.
Jensen Radio Mfg. Co., 6601 S. Lavanie Ave., Chicago, Ill.
Kersten Radio Equipment, Inc., 1415 Fillford, Kalamazoo, Mich.
Kyle. See Newcombe-Hawley.
Magnavox Co., 2250 Horton, Oakland, Cal. Also Units.
Mandel Electric Co., 2157 N. California Ave., Chicago, Ill.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Corp., 31 W. 21st, New York, N. Y.
Minuet. See Thompson Radio Co.
Newton Elec'l Mfg. Co., Newton, Mass.
O'Neil Mfg. Corp., West New York, N. J.
Operadio Mfg. Co., St. Charles, Ill.
Peerless. See United Reproducers Corp.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powerola. See Temple Corp.
Puronower. See Platter Cabinet Co.
Quam Radio Products Co., Div. of United Air Cleaner Corp., 9705 Cottage Grove Ave., Chicago, Ill.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Red Lion Cabinet Co., Red Lion, Pa.
Sonochorde. See Boudette Mfg. Co.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Swoboda Co., Maritime Bldg., Seattle, Wash.
Thompson Radio Co., 25 Church, New York, N. Y.
Ultratone Mfg. Co., 1046 W. Van Buren, Chicago, Ill.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Utona. See American Radio Products Corp.
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
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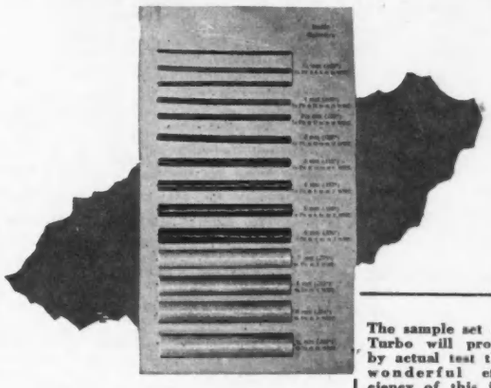

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Dante Elect. Mfg. Co., Bantam, Conn.
French Mfg. Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.

LUMINOUS SPECIALTIES

KEY

Luminous Compound .....See C
Pendants (Bulbs) .....See P
Standard Parts .....See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y..... .. P
Bryant Electric Co., Bridgeport, Conn..... .. P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... .. S
Cutler-Hammer, Inc., 1283 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y... .. .. P
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... S P ..
Glow Lite. See Rodale Mfg. Co.
Hubbell, Inc., Harvey, Bridgeport, Conn..... .. P
Luma & Luma Lite. See Radium Dial Co.
Radiryx. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C .. P
Reynolds Spring Co., Jackson, Mich..... .. S
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... .. P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia .. P
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y. ..... C S P

MACHINE SCREWS. See Screws, Machine.
MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES

Armature Banding. See Banding Machines, Armature
Armature Notching. See Notching Machines, Armature
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making

For Making Incandescent Lamps and Vacuum Tubes.
Argco Laboratories, Inc., 150 W. 22nd, New York, N. Y.
Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass (Vacuum Pumps.)
Cserwenka, Frank, 35 Monroe, Passaic, N. J. (Bombarding Machines.)
Eisler Electric Corp., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York N. Y. (Filament Winder.)
Gesco. See General Engineering & Supply Co
Rhason Mfg. Co., 124 45th, Union City, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Bombarding. See Machines, Lamp Making.
MACHINES, Pleating and Fluting. See Pleating Machines.
MACHINES, Spring Making. See Spring Making Machines
MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.
MAGNET CHARGERS. See Chargers, Magnet.
MAGNET STEEL. See Steel, Magnet.
MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.
MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.
MAGNETIC CHUCKS. See Chucks, Magnetic.
MAGNETIC CLUTCHES. See Clutches, Magnetic.
MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent

Bulldog Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chicago
Rogers Drop Forging Co., Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.

MALLETS, Raw Hide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Crude Pelt. See Chicago Rawhide Mfg. Co.
Holbrook Raw Hide Mfg. Co., 748 N. Main, Providence, R. I.
MANGANESE, Battery. See Chemicals, Battery.

MARKERS AND STAMPERS, Metal

Schmidt, Inc., Geo. T., 4102 Ravenswood Ave., Chicago, Ill.
MEASURING INSTRUMENTS. See Instruments.
METAL CUTTING OUTFITS. See Welding and Cutting
MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.
MEGOHMMETERS. See Instruments. Laboratory Standard

MELTING POTS AND LADLES, SOLDER, ETC.

Dunco. See Struthers Dunn, Inc.
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
MERCURY SWITCHES. See Switches, Mercury.
METAL CLEANERS (Compound). See Cleaners, Metal.
METAL FINISHING. See Plating & Finishing.
METAL MARKING OUTFITS. See Engraving Machines.
METALLIC SHADES. See Shades, Metallic.
METERS. See Instruments.
MICA SHADES. See Shades, Mica.
MICA TAPE. See Tape, Mica.
MICA UNDERCUTTERS. See Slotting Machines & Tools, Commutator.

MICA

Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Fillion, S. O., 63 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 533 Canal, New York, N. Y.
Gillespie-Rogers-Pyatt Co., Inc., 99 John, New York, N. Y.
Hirsch Mica Co 1087 Flushing Ave., Brooklyn, N. Y.
Hoyt, Inc., Philip S., Los Tablos, New Mexico.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Boston 27, Mass.
Micabond. See Chicago Mica Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Mica Products Mfg. Co., 54 Greene, New York, N. Y.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals, Inc., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K., 957 Monadnock Blk., Chicago (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.
MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.
MIXERS, INSULATION. See Insulation Mixers.

MOLDED

Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.
Shades. See Molded Insulation.

MOLDED INSULATION

Alco. See American Insulator Corp.
Aladdinite Co., Orange, N. J. (Caseine.)
Allen & Hills, Inc., Auburn, N. Y.
Ambler Asbestos Shingle & Sheathing Co., Ambler, Pa. (Cold.)
Amboloid. See Ambler Asbestos Shingle & Sheathing Co.
American Insulator Corp., New Freedom, Pa.
American Machine & Foundry Co., 5520 Second Ave., Brooklyn, N. Y.
Amerine. See American Insulator Corp.
Auburn Button Wks., 48 Canoga, Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Beatsol Corp., 30 Littleton Ave., Newark, N. J.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Bettle. See Synthetic Plastics Co., Inc.
Boonton Molding Co., 300 Myrtle Ave., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Bro-lite Moulding Corp., 109 Hudson, Jersey City, N. J. (Wood Composition.)
Celluloid Corp., 10 E. 40th, New York, N. Y.
Cepco. See Monowatt Corp.
Cetec. See Monowatt Corp.
Cetelite. See Monowatt Corp.
Celtruck. See Colt's Patent Firearms Mfg. Co.
Chicago Molded Products Co., 2140 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensalite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Cutler-Hammer, Inc., 1283 St. Paul Ave., Milwaukee.
Dayton Insulating Moulding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimec. See Dayton Insulating Moulding Co.
Durez. See General Plastics, Inc.
Electrical Insulation Corp., 308 W. Washington, Chicago, Ill.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y
Evercool. See Bakelite Corp.
Formica Insulation Co., 4626 Spring Grove Ave., Cincinnati
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 39 E. Walck Rd., N. Tonawanda, N. Y.
Grotelite Co., Grandview & Lafayette Aves., Bellvue, Ky
Gummer. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.

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Herculite. See Colosta Co.
Hi-Heet. See Insulation Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Improco. See Insulation Products Co.
Inda. See American Machine & Foundry Co.
Insulation Mfg. Co., New York Ave. and Herkimer St. Brooklyn, N. Y.
Insulation Products Co., Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y
International Insulating, Division of General Industries Co., Syria, Ohio.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Klaggen, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Luce Products Corp., 40 Flatbush Ave. Extension, Brooklyn, N. Y.
Lumarith. See Celluloid Corp.
Luxite. See Wilbur & Williams Co.
Macallen Co., Boston, 27, Mass.
Mack Molding Co., Wayne, N. J.
Makalot. See Johnson Molding & Tool Co.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Mica. See Molded Insulation Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
Molded Insulation Co., Mt. Vernon, N. Y.
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
New England Products Co., 232 Greenwich, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Norlac. See Norton Laboratories, Inc.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., Div. 82, Lockport, N. Y.
Panelyte Corp., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Plastic Molding Corp., Sandy Hook, Conn. (Cold.)
Plymouth Mfg. Co., 2148 Walnut, Chicago, Ill.
Pollopas. See Wilbur & Williams.
Pruven Compositions Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 212 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Star Insulate. See Insulation Mfg. Co.
Starite. See Insulation Mfg. Co.
Stokes Rubber Co., Jos., Trenton, N. J.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synthetic Plastic Co., Inc., 535 Fifth Ave., New York, N. Y. (Molding Powder).
Textolite. See General Elec. Co., also Electrical Insulation Corp.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.
Waterbury Button & Moulding Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa
Wilbur & Williams Co., 261 Park Square Bldg., Boston, Mass. (Molding Powder.)

MOLYBDENUM

American Electro Metal Corp., 65 Madison Ave., New York, N. Y.
Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Strian Wire Co., 285 Sherman Ave., Newark, N. J.

MONEL METAL

International Nickel Co., 67 Wall, New York, N. Y.
MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform.
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches Snap (Heavy Duty).

MOTORS

Alternating Current .....See S
Direct Current .....See S
Motors, 1 Hp. up .....See M
Motors Fractional Hp. .....See F
Universal .....See U

Actodector. See Roth Bros. Co., Div. of Century Electric Co
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis..... M .. S ..
Allis Co., Louis, Milwaukee, Wis..... M .. S ..
American Elec. Motor Co., Cedarburg, Wis..... M .. .. ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M .. .. ..
Baldor Elec. Co., 4353 Duncan Ave., St. Louis M F S ..

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Bodline Elec. Co., 2256 W. Ohio, Chicago..... F S U
Hegeus Elec. Co., Chas. J., 133 King, New York M
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O..... M F
Burke Elec. Co., Erie, Pa..... M F S U
B. T. See Allis Co., Louis.
B & B Mfg. Co., 812 Lafayette, Toledo, O..... F
Century Elec. Co., 1806 Pine, St. Louis, Mo.. M F S
Chandeysson Elec. Co., St. Louis, Mo..... M S
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky..... M
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O..... M S
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Continental Elec. Co., 14 Magazine, Newark.. M S
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M S U
Cushman Elec. Co., Concord N. H..... M F S
Diehl Mfg. Co., Elizabeth, N. J..... M F S
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., Kent, O..... S U
Dumore Co., 35 18th, Racine, Wis..... F U
Eclipse. See Fidelity Elec. Co.
Edco. See Electro Dynamic Co.
Electric Machinery Co., Minneapolis, Minn.. M S
Electric Products Co., 1720 Clarkstone Rd., Cleveland, O.....
Electric Specialty Co., 221 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J..... M S
Emerson Electric Mfg. Co., 2014 Washington Ave., St. Louis, Mo..... M F S U
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., 900 S. Wabash Ave., Chicago, Ill..... M F
Fidelity Elec. Co., Lancaster, Pa..... M F S
Fitzgerald Mfg. Co., Torrington, Conn..... F
Fynn Weichsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo..... F S
General Motors Radio Corp., Miami Chapel Rd. & Wisconsin Blvd., Dayton, O..... F S
Gilbert Co., A. C., New Haven, Conn..... F U
Hamilton Beach Mfg. Co., Racine, Wis..... F U
Hobart Bros. Co., Troy, O..... M S
Holtzer-Cabot Elec. Co., 125 Amory, Boston.... M
Howell Elec. Motors Co., Howell, Mich..... M F S
Ideal Elec. & Mfg. Co., Mansfield, O..... M S
Imperial Electric Co., Akron, O..... M S
Janette Mfg. Co., 551 W. Monroe, Chicago..... F S
Jantz & Leist Elec. Co., Cincinnati, O..... M F
Kendrick & Davis Co., Lebanon, N. H..... F S
Kimble Elec. Co., 634 N. Western Ave., Chicago M F U
Knapp Elec., Inc., Portchester, N. Y..... F U
Leland Elec. Co., Dayton, O..... F S
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio..... M S
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O..... M
Mando Co., 911 State Tower Bldg., Syracuse, N. Y. (6-12-40 Volt only)..... F
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. F
Marble-Card Elec. Co., Gladstone, Mich..... M
Master Electric Co., Dayton, O..... M F S
MC. See General Electric Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich.. F S
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
North East Appliance Corp., Rochester, N. Y.. F U
Northwestern Mfg. Co., 480 Clinton, Milwaukee M
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio..... F S
O. K. See Marathon Elec. Mfg. Co.
Onsmn Co., F., 245 Seventh Ave., New York M
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O..... M S
Reynolds Electric Co., 2650 W. Congress, Chicago .. F S
Robbins & Myers, Inc., Springfield, O..... M F S U
Roth Bros. & Co., Div. of Century Elec. Co., 1400 W. Adams, Chicago, Ill..... M F S
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J..... M S
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal..... M S
Stow Mfg. Co., Binghamton, N. Y..... M F S U
Sturtevant Co., 15 Devonshire (Hyde Park), Boston, Mass..... M F S U
Sunlight Electrical Mfg. Co., Warren, O..... F S
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Troy Engine & Machine Co., Engberg's Div., St. Joseph, Mich..... M S
Union Elec. Motor Mfg. Co., Hancock & Orford Sts., Philadelphia, Pa..... M F S

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Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo..... M S
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va..... M S
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S
Willey-Wray Elec. Co., 1523 Central Parkway, Cincinnati, O..... M S
Woods Mach. Co., S. A., Boston..... M F S
Zobell Elec. Motor Co., Garwood, N. J..... M S

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Continental-Diamond Fibre Co., Bridgeport, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Electro-Chemical Engraving Co., 52 Vanderbilt Ave., New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y.
Etching Co. of America, 1520 Montana, Chicago, Ill.
General Etching & Mfg. Co., 3070 W. Grand Ave., Chicago, Ill.
Grammes & Sons Inc., L. F., Allentown, Pa.
Mayer & Co., Geo. J., 36 S. Meridian, Indianapolis, Ind.
Mechanical Engraving Co., 130 Orchard, Newark, N. J.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. J.
Turner Brass Works, Sycamore, Ill.
Waterbury Button & Moulding Co., Waterbury, Conn.

NICKEL
American Mond Nickel Co., Century Bldg., Pittsburgh, Pa.
Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y
National-Harris Wire Co., 195 Verona Ave., Newark, N. J
Seymour Mfg. Co., Seymour, Conn.

NOTCHING MACHINES, Armature
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo, N. Y.

NUT SETTING MACHINES
Vim Electric Tool Co., 149 Broadway, New York, N. Y.

OHMMETERS. See Instruments, Laboratory Standard; also Instruments, Portable and Switchboard.

OIL-LESS BEARINGS. See Bearings, Oil-less.

OSCILLOSCOPES. See Instruments, Laboratory Standard.

OVENS, Industrial and Laboratory
Annealing, Temper Drawing, Mold Baking, Vulcanizing, Drying, Conditioning, Enameling, Japanning, Vacuum Impregnating.
Argco Laboratories, Inc., 150 W. 22nd, New York, N. Y.
Buffalo Fdry. & Machine Co., 1543 Fillmore, Buffalo, N. Y. (Armature and Coil.)
Conran, Frederick M., 107 Colden, Newark, N. J.
Crawford Oven Co., New Haven, Conn. (Coil Driers.)
Despatch Oven Co., 622 Ninth, S. E., Minneapolis, Minn.
Detroit Sheet Metal Wks., 1341 E. Milwaukee Ave., Detroit, Mich.
Devine Mfg. Co., J. P., Mount Vernon, Ill.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas Thermo Elec. Co., 1206 Grove, Irvington, N. J.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 196 Piedmont, Waterbury, Conn.
Lydon Bros., 229 Colden, Jersey City, N. J.
Maehler Co., Paul, 2220 West Lake, Chicago, Ill.
Miho Co., 717 Sycamore, Cincinnati, O.
Sargent & Co., E. H., 155 E. Superior, Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Standard Elec. Stove Co., Toledo, Ohio.
Steiner & Co., H. E., 197 E. Kinney St., Newark, N. J.
Stokes Machine Co., F. J., 5834 Tabor Rd. (Olney), Philadelphia.
Swartwout Co., 18522 Euclid Ave., Cleveland, O.
Thelco. See Freas Thermo Elec. Co.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Young Bros. Co., 6523 Mack Ave., Detroit, Mich.

OXIDES, Battery. See Chemicals, Battery.

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Holed-Tite Packing, Inc., 100 E. 42nd, New York, N. Y.
Packtite. See Federal Metallic Packing Co.

PAINT, Varnish, Lacquer KEY
Varnishes, Insulating ..... See V
Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof..See P
Lacquer, Metal Finishing ..... See L

Acme White Lead & Color Wks., 1258 St. Aubin Ave., Detroit, Mich..... L
Ajax. See Sherwin-Williams Co.
Alaka. See Lacquer & Chemical Corp.
American Di-Electric, Ltd., Hancock and Bodine, Long Island City, N. Y..... V
American Lastite Co., 3168 Lincoln Ave., Chicago.. P L
American Wurtzilite Co., Builders Bldg., Chicago .. P
Antakwa Co., 1329 Mohawk, Chicago, Ill..... P
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. L
Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-Craft. See Southwestern Paint & Varnish Co.
Atlantic Chemical Co., Colt, Irvington, N. J..... L
Atom Chemical Co., 96 E. 10th, New York, N. Y..... L
Ault & Wiborg Varnish Wks., 432 New, Cincinnati, O..... V
Bakelite Corp., 247 Park Ave., New York, N. Y..... L
Benolite Varnish Co., 501 Columbia Bank Bldg., Pittsburgh..... V P
Berry Bros., Leib & Wight, Detroit, Mich..... V
Billings-Chapin Co., 1163 E. 40th, Cleveland, O.. V
Biwax Corp., 208 S. La Salle, Chicago, Ill..... P
Bradley-Hurtz Co., 2620 S. Dearborn, Chicago, Ill. L
Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y..... V P
Carboloid Products Corp., 15 Park Row, New York, V P
Chadeloid Chemical Co., 75 E 45th, New York, V
Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J..... V P
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzeins, Columbus, O. V
Comulac. See Martindale Elec. Co.
Continental-Diamond Fibre Co., Bridgeport, Pa. V
Day & Co., James B., 1872 Clybourn Ave. Chicago, Ill..... P L
Doe & Co., Walter S., Kent, Ohio..... P L
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del... P
Durez. See General Plastics.
Eastman Kodak Co., Rochester, N. Y..... L
Eclipse Paint & Mfg. Co., Cleveland, O..... P
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York.... L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O..... L
Ferbert-Schorndorfer Co., 12815 Elmwood Ave., Cleveland, O..... V P L
Fesco. See Ferbert-Schorndorfer Co.
Five Point. See American Wurtzilite Co.
Francke & Co., 440 Orleans, Chicago, Ill.. L
General Elec. Co., Dept. M-327, Bridgeport, Conn. V P
General Plastics, Inc., 39 E Walck Rd., N. Tonawanda, N. Y..... V
George Co., P. D., 4153 Bingham Ave., St. Louis. V
G. E. See General Elec. Co.
Glidden Co., Cleveland, O..... V P L
Glyptal. See General Electric Co., Schenectady.
H. B. See Maas & Waldstein Co.
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P
Insulaterite. See Ohmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lackerite. See Twin City Shellac Co., Inc.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y..... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. Co., 450 E. 3rd, Dayton, O..... V P
Lucas & Co., John, 333 Race, Philadelphia, Pa.. V P
Lucote. See Lucas & Co., John.
Maas & Waldstein, 438 Riverside Ave., Newark, N. J..... L
Martindale Elec. Co., 1263 W. Fourth, Cleveland, O..... V
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V
M. I. C. See Mica Insulator Co.
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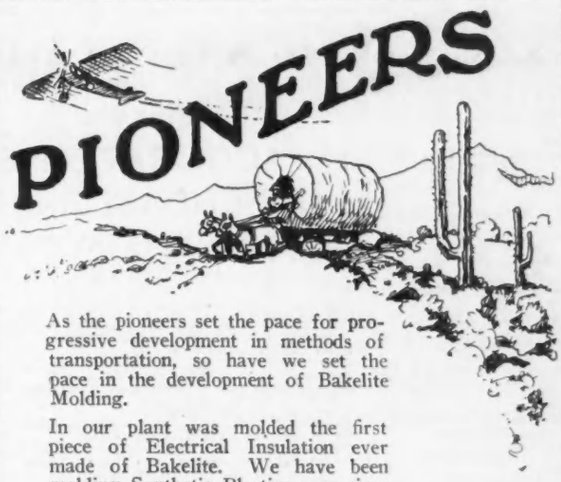

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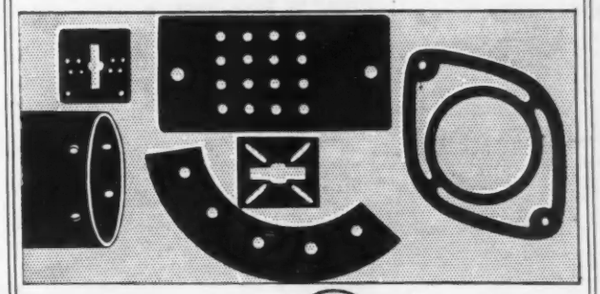

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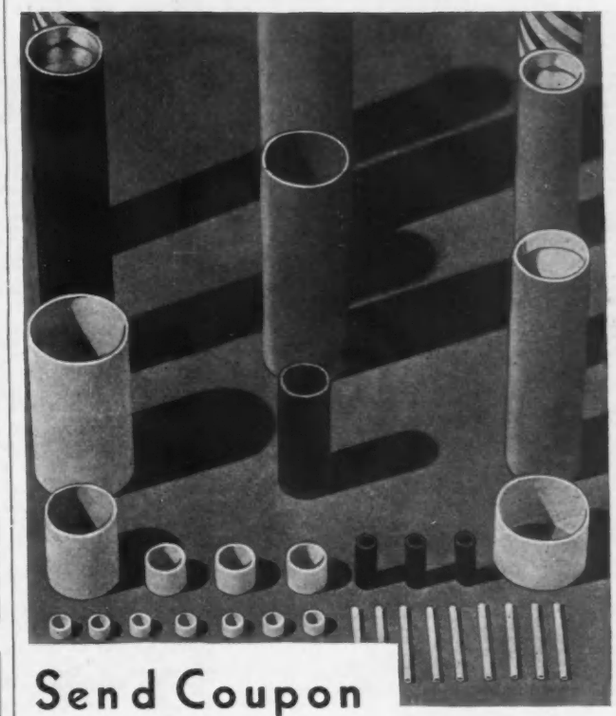

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Opex. See Sherwin-Williams Co.
Orlite. See Standard Underground Cable Co.
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Pecora Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. . . P L
Reliable Leather Dressing Co., 43 Crescent, Long Island City, N. Y. . . . . V . . .
Republic Varnish Co., 200 Thomas, Newark, N. J. V . . .
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. . . . . V P . .
S. P. C. See Ruberoid Co.
Schenectady Varnish Co., Schenectady, N. Y. . . . . V P . .
Schorndorfer, Ferbert, 12815 Elmwood Ave., Cleveland, O. . . . . V P . .
Sherwin-Williams Co., Cleveland, O. . . . . V P L
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. L
Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo. . . . . V P . .
Standard Flexible Comp. Co., 5242 Lancaster Ave., Philadelphia, Pa. . . . . V P . .
Standard Insulation Co., Rutherford, N. J. . . . . V . . .
Standard Lacquer Co., 621 Broadway, New York. L
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. . . . . P . .
Standard Varnish Wks., 443 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa. . . . . V . . .
Toch Bros., 443 4th Ave., New York. . . . . V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. . . . . V . . .
2093. See Mitchell-Rand Mfg. Co.
Twin City Shellac Co., Inc., 338 Flushing Ave., Brooklyn, N. Y. . . . . V P L
Varflex Corp., Rome, N. Y. . . . . V . . .
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P . .
Walpole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill. L
Walker Co., Henry V., 17 John St., New York. L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P . .
Zapon Co., Stamford, Conn. L
Zellac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. L

PANELS (panel) Engraving. See Engraving.
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber) See Rubber Hard.
Meters. See Instruments, Portable & Switchboard.

PAPER
Boxes. See Boxes & Wrappers.
Bushings. See Tubes, Paper.
Candles. See Candles, Fixture.
Cores. See Tubes, Paper.
Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

PARAFFINE. See Wax and Compounds.

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Brown Paper Co., L. L., Adams, Mass.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago, Ill
De Jonge & Co., Louis, 69 Duane, New York, N. Y.
New York & Penn Co., 200 5th Ave., New York, N. Y.
Paterson Parchment Paper Co., Passaic, N. J.
Raquette River Paper Co., Potsdam, N. Y.
Reeve & Co., Angel H., 7 Spruce, New York, N. Y.
Special Paper Mfg. Co., 98 Reade, New York, N. Y.
Strype, Fred C., 140 Lafayette, New York, N. Y.
Taylor-Logan Co., Holyoke, Mass.
Union Paper & Twine Co., 116 St. Clair Ave., N. W., Cleveland, O.
Warren Parchment Co., Dexter, N. Y.
Weber Co., F., 1220 Buttonwood, Philadelphia, Pa.
West Carrollton Parchment Co., West Carrollton, O.
Windsor Locks Paper Mills Co., Windsor Locks, Conn.

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Bates & Sons, E. B., 5844 Grand Central Terminal Bldg. New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
National Vulcanized Fibre Co., Wilmington, Del.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass
White Supply Co., 4347 Duncan, St. Louis, Mo.

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Gilbert Supply Co., Independence, Iowa.
Little Speedster. See Gilbert Supply Co.
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Stylectric. See Post Electric Co.

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Capital Novelty Co., Lincoln, Neb.
Cummings Co., S. F., 4740 Ravenswood Park, Chicago, Ill
Hamilton Engrs. Products Co., Hamilton, Ohio (Music Rolls).

PHENOLIC INSULATION. See Fibre, Phenol. Also Molded Insulation.

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Elephant Brand. See Phosphor-Bronze Smelting Co.
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Foto Cell. See National Carbon Co.
General Electric Co., Schenectady, N. Y.
G-M Laboratories, Inc., Grace & Ravenswood Ave., Chicago.
Kino-Lamp. See Raytheon Mfg. Co.
McWilliams. See Electric B-G Products Co.
National Carbon Co., New York, N. Y.
Photion Instrument Corp., 574 Southern Blvd., New York.
Visitron. See G-M Laboratories, Inc.
Westinghouse Elec. & Mfg. Co., Mansfield, Ohio.

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Foote, Pierson & Co., 75 Hudson, Newark, N. J.
Holophane Co., 342 Madison Ave., New York, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Luxometer. See James G. Biddle
Mathews. See Foote, Pierson & Co.
National Lamp Wks., Cleveland, O.

PICK-UPS, TALKING MACHINE. See Loud Speakers.

PIGTAILS, Commutator. See Brushes, Commutator.
Wire Gauze. See Brushes, Commutator.
Vacuum Cleaner. See Brushes for Vacuum Cleaners

PINIONS. See Gears and Pinions.

PINION PULLERS. See Pullers, Armature Shaft.

PLASTICS. See Molded Insulation.

PLATES, Name. See Name Plates; Also Decalcomania
Fixture Outlets. See Fixture Fittings.
Storage Battery. See Plates, Storage Battery
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.

PLATES, Storage Battery
Ace Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind
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C. & G. Battery Co., 1535 S. State, Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Englert Mfg. Co., 2500 Jane, Pittsburgh, Pa.
Exta. See New Jersey Storage Battery Co.
Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
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Conpro. See Eager Elec. Co.
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Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
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Ideal Electric & Mfg. Co., East Third St., Mansfield, O.
Jantz & Leist Elec. Co., Cincinnati, O.
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L'Hommedieu & Sons Co., Chas. F., 37 S. Clinton, Chicago, Ill.
Optimus. See Hanson-Van Winkle & Munning Co.
Reliance. See L'Hommedieu & Sons Co., Chas. F.
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Chromalite. See Metals Protection Corp.
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Duro Chrome. See General Chromium Corp.
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Metals Protection Corp., 401 Michigan, Indianapolis, Ind.
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Rochester Elec. Products Corp., 89 Allen, Rochester, N. Y.
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Udylite Process Co., 3220 Bellevue Ave., Detroit, Mich. (Rust-Proof Finish.)
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Baker & Co. Inc. 54 Austin, Newark N J
Bishop & Co., Platinum Wks., J., Malvern, Pa.
Coffin Mfg. Co. B. F. 30 Court, Newark, N J
Interstate Products Corp., 503 Mulberry, Newark, N. J.
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 742 Market, San Francisco, Cal
Wilson Co., H. A., Newark, N. J.

PLUG FUSES. See Fuses and Fuse Wire.
PLUG RECEPTACLES. See Receptacles, Plug.
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Eastman Mfg. Co., Manitowoc, Wis.
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Electric Co., 94 Allyn, Hartford, Conn
Ericson Mfg. Co., 2257 Bradford Rd., Cleveland, O.
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Hart Mfg. Co., Hartford, Conn.
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Heetach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman.
Hubbell, Inc., Harvey, Bridgeport, Conn
Iffy. See Esler Elec. Mfg. Co.
Kool Plug. See Colt's Patent Fire Arms Mfg. Co.
Leviton Mfg. Co., 236 Newell, Brooklyn, N. Y.
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa
Pass & Seymour, Solvay Sts., Syracuse, N. Y.
Quartap. See Connecticut Elec. Mfg. Co.
Poloron Elec. Mfg. Corp., 26 Waverly Pl., New York, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripple. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Safegard Elec. Appliance Co., 133 S. Twelfth, Philadelphia
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W.
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Standard. See Cutler-Hammer Mfg. Co.
Suitsall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
Sure Grip. See Alden Mfg. Co.
T. E. C. See Electric Co.
Tedeo. See Paragon Elec. Sales Co.
Telitale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
Triple Tap. See General Elec. Co.
Twin Tap. See General Elec. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilshires. See Iona Co.
Yankee. See Beaver Mfg. Co.

POCKET METERS. See Instruments, Pocket.

POINTS, Contact
American Platinum Wks., 241 New Jersey Railroad Ave., Newark, N. J.
Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold, Platinum Silver.)
Bishop & Co., Platinum Wks., J., Malvern, Pa.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Fansteel Products Co., North Chicago, Ill.
General Plate Co., Attleboro, Mass.

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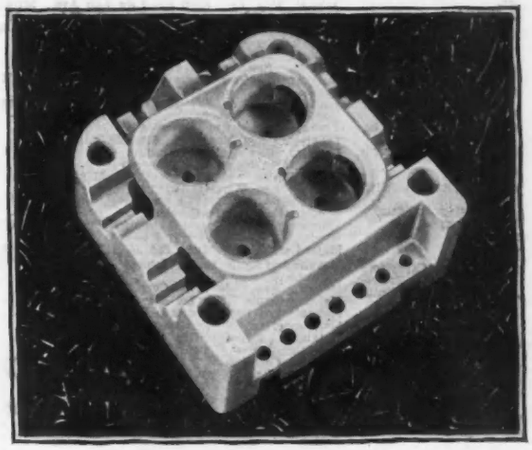

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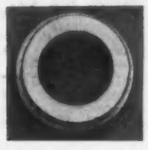

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POINTS, Contact—Continued
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Interstate Products Corp., 503 Mulberry, Newark, N. J. (Platinum and Silver.)
National Contact Co., 33 W. 60th, New York. (Platinum.)
Nisbeff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
Spark-O-Metal. See Hardy Metal Corp.
Tungsten Electric Corp., 545 39th, Union City, N. J.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J. (Platinum and Silver.)
POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN
Beads. See Beads, Insulating.
Bushings. See Bushings, Box & Cabinet.
Cement. See Cement, Liquid, Porcelain.
Insulators. See Porcelain.
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.
Tubes. See Porcelain.

PORCELAIN, Special Shapes

Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Central Porcelain Co., Columbiana, O.
Challenge Stamping & Porcelain Co., Grand Haven, Mich.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Crowley & Co., 1 Central Ave., West Orange, N. J.
Crowlite. See Crowley & Co.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y.
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard & Specialty Porcelain Co., Sun Prairie, Wis
Star Porcelain Co., Muirhead St., Trenton, N. J.
Stupakoff Laboratories, 6627 Hamilton Ave., Pittsburgh, Pa.
Thomas & Sons Co., R., Lisbon, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

POROUS CUPS

Unglazed earthenware cups for primary (wet) batteries
Colonial Insulator Co., Akron, Ohio.
Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding

Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
DeJur-Amsco Corp., 418 Broome, New York, N. Y.
Eby Mfg. Co., Inc., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros., Piano, Ill.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Polk, J. L., 41 Bell Ave., Troy, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn.
POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil

Comstock Mfg. Co., Wilkes-Barre, Pa.
PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation

Burroughs Co., 246 N. Tenth, Newark, N. J.
Busch-Sulzer Bros. Diesel Engine Co., Second & Utah Sts., St. Louis, Mo.
Dunning & Boschert Press Co., 329 W. Water, Syracuse
Duo-Press. See Busch-Sulzer Bros.
Elmes Engrg. Works, Chas. F., 230 N. Morgan, Chicago
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill
Farquhar Co., A. B., York, Pa.
French Oil Mill Machinery Co., Piqua, O.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5534 Tabor Rd. (Olney), Philadelphia, Pa.
Terkelsen Machine Co., Terkelsen Bldg., Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y.
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding

Baird, Andrew, 2715 Newark, Detroit, Mich.

PRESSES, Punching and Bending

Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
American Can Co., 230 Park Ave., New York, N. Y.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y

1. Air Heaters
2. Automatic Motor Starters.
3. D. C. Battery Charging Equipment.
4. Field Rheostats.
5. Laboratory Resistors and Rheostats.
6. Motor Starters and Controllers A. C. and D. C.
7. Radio Resistors and Rheostats.
8. Resistors for all purposes.
9. Rheostats for all purposes.
10. Speed Controllers.
11. Theatre Dimmers.

WARD LEONARD ELECTRIC CO.
31-41 South St. Mount Vernon, N. Y.

Cameo. See American Can Co.
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyre Mfg. Co., 200 Varick, New York, N. Y.
Loshbough-Jordan Tool & Machine Co., Elkhart, Ind
Niagara Machine & Tool Wks., 637 Northland, Buffalo.
Peck, Stow & Wilcox Co., Southington, Conn.
Rockford Iron Works, 846 Bay, Rockford, Ill.
PRESSES, Stamping. See Presses, Punching & Bending.
PRISMS, Chandelier. See Crystals, Chandelier.
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft

Motor Pulley, Shaft & Pinion Pullers & Extractors.
Allen Electric & Equipment Co., Kalamazoo, Mich.
Big Buster. See Premier Elec. Co.
Crane Puller Co., West Newton, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff-Norton Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts. Philadelphia, Pa.
Little Giant. See Premier Elec. Co.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., 3800 Ravenswood Ave., Chicago, Ill.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition

General Electric Co., Schenectady, N. Y.
Rockwood Mfg. Co., Indianapolis, Ind.
Sprucolite Co., Bloomfield, N. J.

PUMPS, Oil Burner

Jenette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago.
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.

PUMPS, Vacuum

To Exhaust Incandescent Lamps.
Beach-Russ Co., 50 Church, New York, N. Y.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Cenco. See Central Scientific Co.
Central Scientific Co., 460 E. Ohio, Chicago, Ill.
Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Eimer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Elec. Corp., 756 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Megavac. See Central Scientific Co.
Packard. See Hubbard's Sons, Norman.
PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.

RACKS, Wire Reel

(With Tension Device Attached).
Armature Coil Equipment Co., 3415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1820 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler.)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS

This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
Acme Appar. Corp., 39 Osborne, Cambridge, Mass.
Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 4611 Ravenswood Ave., Chicago, Ill.
Air-King Products Co., 216 Wallabout, Brooklyn, N. Y.
Ajax Elec. Specialty Co., St. Louis, Mo.
Akra-Ohm. See Shallcross Mfg. Co.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Apparatus Co., Richmond, Ind.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Ares Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Art Dial. See Pilot Radio & Tube Corp.
Audioformer Transformer. See Pacent Electric Co.
Autoformer. See Thordarson Elec. Mfg. Co.
Automatic Oil Heat Co., 9294 E. Fourth, St. Paul, Minn.
Automotive Parts Mfg. Co., 70 Washington St., Brooklyn.
B-Conomizer. See Pilot Radio & Tube Corp.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., Calvary, Waltham, Mass.
Buffer. See Aerovox Wireless Corp.
Buffalo. See De Jur-Amsco Corp.
Camfield. See Columbia Metal Products Co.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacitgrad. See Pilot Radio & Tube Corp.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill.
Central Radio Corp., Beloit, Wis.
Centralinc. See Pilot Radio & Tube Corp.
Certified Condenser. See Radio Condenser Co.

Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Clarostat Mfg. Co., 281 N. Sixth, Brooklyn, N. Y. (Radio Resistance.)
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O.
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J
Columbia Metal Products Co., 360 E. Grand Ave., Chicago.
Cunertone. See Chicago-Jefferson Fuse.
Connectoralds. See Alden Mfg. Co.
Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Cornell Elec. & Mfg. Co., Anable & Rawson, Long Island City, N. Y.
Crosradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crofot. See Premier Elec. Co.
Cub. See Cornell Electric & Mfg. Co.
Daven Co., 158 Summit, Newark, N. J. (Kits)
Davohm. See Daven Co.
DeForest Radio Co., Passaic, N. J.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 342 Madison av., New York
Dumont Elec. Co., 40 W. 17th, New York, N. Y.
Duratran. See Dubilier Condenser Corp.
Durham & Co., 1836 Market, Philadelphia, Pa.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon, Inc., 350 Madison Ave., New York, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., 3932 Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See De Jur-Amsco Corp.
Filterettes. See Tobe Deutschmann Co.
Fiechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., 1143 W. Beardsley, Elkhart, Ind.
Furnell Die Cast Condenser Corp., 16 Hudson, New York
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 910 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Ger-Alt Radio Laboratories, 859 Flatbush Ave., Brooklyn, N. Y. (Adapter.)
Glastor. See Daven Co.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hardwick, Hindle, Inc., 123 Greenwich, New York, N. Y.
Harmonik. See Karas Elec. Co.
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Trenton, N. J.
Hald-Tite, Hi-ohm, Hi-pot. See Carter Radio Co.
Hi-Q Kit. See Hammarlund.
Hum-Dinger. See Clarostat Mfg. Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 4322 Lake Ave., Rochester, N. Y.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa.
Isograd, Isoleak. See Pilot Radio & Tube Corp.
Jefferson Electric Co., 1500 S. Laflin, Chicago, Ill.
J-M-P. Mfg. Co., 3329 Fond du Lac Ave., Milwaukee, Wis.
Karas Elec. Co., 4046 N. Rockwell, Chicago, Ill
Kenyon Transformer Co., 122 Cypress Ave., New York, N. Y
Kilograd. See Pilot Radio & Tube Corp.
Krohnlack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
Lavite. See Aerovox Wireless Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance)
Leakandenser. See Daven Co.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran See Electrical Research Laboratories
Mayo Laboratories, Inc., 231 E. 137th, New York, N. Y.
Mayolian Corp., 1445 Webster Ave., New York, N. Y (Tone Filter.)
Meggit. See Cole Mfg. Corp.
Melco-Supreme. See De Jur-Amsco Corp.
Melcoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metralign. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Micrograd. See Pilot Radio & Tube Corp.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 3440 S. Chicago Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Neutro-Grad. See Pilot Radio & Tube Corp.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohio Carbon Co., 3215 Almira Ave., Cleveland, O.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill (Resistance.)
One Way. See Carter Radio Co.
Orthometric. See Karas Elec. Co.
Orthophone. See De Jur-Amsco Corp.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol See Wireless Radio Corp.
Perry Elec'l Resistor Corp., 280 New Main St., Yonkers N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Plander. See De Jur-Amsco Corp.
Pierce Airo. See United Scientific Laboratories.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Radio & Tube Corp.
Potter Mfg. Co., North Chicago, Ill.
Polymet Mfg. Corp., 829 E. 134th St., New York, N. Y.

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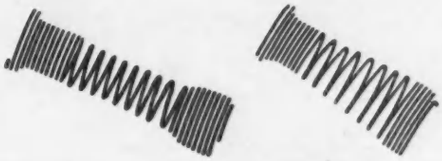

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Power Box. See Scott Sales Co.
Powerohm. See International Resistance Co.
Powrad, Inc., 121 Ingraham, Brooklyn, N. Y.
Precision Coil Co., 122 Greenwich, New York, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Protectoraid. See Alden Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Appliance Corp., Springfield, Mass.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave.. New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Receptrad. See Radio Receptor Co.
Reesonator. See F. & H. Radio Laboratories.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Radio & Tube Corp.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Scovill Mfg. Co., Waterbury, Conn.
Sensory. See Heinemann Electric Co.
Sevlam Magneto Engr. Co., 397 Phillips, Toledo, O.
Shallcross Mfg. Co., 700 Parker Ave., Collingdale, Pa.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 6401 W. 65th St., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Submariner. See J-M-P Mfg. Co.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Syncrodenser. See Precise Mfg. Corp.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thomas Engineering & Mfg. Co., 616 S. Michigan Ave., Chicago, Ill.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago
Tobe Deutschman Co., Canton, Mass.
Tone Control. See Sprague Specialties Co.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tunadapta. See Lynch, Arthur H.
Tuway. See Carter Radio Co.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Ultra Vario. See Bruno Radio Corp.
Univernier Condenser. See Auburn Button Works.
Universal Electrn Chemical Corp., 30 W. 15th, New York
Universal Winding Co., Boston, Mass.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Variall Condenser. See Muter Co.
Volta. See Universal Electro Chemical Corp.
Volumgrad. See Pilot Radio & Tube Corp.
Walbert Radio Corp., 1000 Fullerton Ave., Chicago, Ill.
Ward Leonard Electric Co., 31 South, Mount Vernon, N. Y.
Waterbury Button & Moulding Co., Waterbury, Conn.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass.

RADIO HARDWARE. See Radio Mountings.

RADIO MOUNTINGS

Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels, etc.

Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Brockton, Mass.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., 135 Grand, New York.
Bonza. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y (Metal Panels.)
Eureka. See Morse Co Frank W.
General Etching & Mfg. Co., 3072 West Grand Ave., Chicago, Ill. (Metal Panels & Escutcheons.)
Globe Technolian Corp., Reading, Mass.
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Master Engineering Co., 122 S. Michigan Ave., Chicago, Ill.
Morse Co., Frank W., 251 Congress, Boston, Mass.
Muter Co., Leslie F., 9440 S. Chicago Ave., Chicago
Na-Ald. See Alden Mfg. Co.
Union Insulating Co., 296 Broadway, New York, N. Y.
Waddell Mfg. Co., Grand Rapids, Mich.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.

Acme Elec. & Mfg. Co., 1653 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amacostat. See American Apparatus Co.
American Apparatus Co., Richmond, Ind.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn
Cabelag. See Jones, Howard B.
Carter Radio Co., 407 S. Aberdeen, Chicago, Ill. (Also Socket Adapters.)
Central Radio Laboratories, 14 Keefe Ave., Milwaukee.
Centralab. See Central Radio Laboratories.
Claroat Mfg. Co., 285 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 20 Hollister, Buffalo, N. Y
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
De Vaux. See Stanley & Patterson
Dongan Elec. Mfg Co., 2985 Franklin, Detroit, Mich.
Duostat. See De Jur-Amsco Corp.
Dynofilter Mfg. Co., 1022 E. 178th, New York, N. Y. (Interference Eliminator).

E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., 1142 W. Beardsley, Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 225 Varick, New York, N. Y
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heinemann Elec. Co., Trenton, N. J.
Hmp. See Carter Radio Co.
Jones, Howard B., 2300 Wabansia, Chicago. (Multiple Plug)
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Micrograd. See Pilot Radio & Tube Corp.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 251 Congress, Boston, Mass.
Muter Co., Leslie F., 9440 S. Chicago Ave., Chicago.
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 829 E. 134th St., New York, N. Y.
Premier Elec. Co., 3800 Ravenswood Ave., Chicago, Ill.
Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio.
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Royalty. See Electrad, Inc.
Samson Elec. Co., Canton, Mass.
Socostat. See D. A. Radio Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tubeastat. See Muter Co.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Workrite Radio Corp., 1838 E. 30th, Cleveland, O.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Electric Co., 187 Sylvan Ave., Newark, N. J.
Arcturus Radio Tube Co., 200 Sherman Ave., Newark, N. J.
Cable Radio Tube Corp., 80 N. Ninth, Brooklyn, N. Y.
Ceco Mfg. Co., 1200 Eddy, Providence, R. I.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
Daven Co., 158 Summit, Newark, N. J.
DeForest Radio Co., Passaic, N. J.
Diamond Electric Co., Newark, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago
Eveready Raytheon. See National Carbon Co.
Gold Seal Electrical Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hygrade Lamp Co., Salem, Mass.
Hytron Corp., Salem, Mass.
Jaeger Research Laboratories, 280 Park Ave., Weehawken, N. J.
Ken-Rad Tube & Lamp Corp., Owensboro, Ky.
La Salle Radio Corp., Div. of Matchless Elec. Co., 1500 N. Ogden Ave., Chicago, Ill.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
National Carbon Co., New York, N. Y.
National Radio Mfg. Co., 1020 S. Central Park Ave., Chicago, Ill.
Neptron. See Hygrade Lamp Co.
Northern Mfg. Co., 367 Ogden, Newark, N. J.
Paramount Mfg. Co., 79 Orange, Newark, N. J.
Pentode. See Ceco Mfg. Co.
Perryman Electric Co., 4901 Hudson Blvd., North Bergen, N. J.
Radio-Victor Corp. of America, 233 Broadway, New York.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.

RADIO TRANSFORMERS. See Radio Circuit Components.

RADIO TUBE BASE BRANDERS. See Engraving Radio Panel.

RADIO TUBE BASES. See Radio Molded Parts.

RADIO TUBE BULBS (Unfinished). See Bulbs, Glass.

RADIO TUBE PARTS

Filament Hooks, Screens, Bolts & Nuts & Special Stampings.

Juno Fasteners, Inc., Hillside, N. J.
Newark Wire Cloth Co., 351 Verona Ave., Newark, N. J. (Screens).

RADIO WIRING HARNESS

Special wiring cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.

Afco. See American Fabric Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alden Mfg. Co., Brockton, Mass. (Adapters.)
Alpbus. See Alpha Wire Corp.
Alpha Wire Corp., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Wire Corp.
American Braiding Co., Holyoke, Mass.
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid, Inc.
Brach Mfg. Co., L. S., Newark, N. J.
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid, Inc., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Diamond Braiding Mills, Chicago Heights, Ill.
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind. (Adapters.)
Hatfield Rubber Wks., Inc., Hillside, N. J.
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Riga. See Birnbach Radio Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Mfg. Co., 52 Orawaupun St., White Plains, N. Y.

RADIUM POWDER AND PAINT

Radium Dial Co., 3333 Forbes, Pittsburgh, Pa.

Gage List of
Electrical Buyers
The Trade Authority

Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.

RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.

RAWHIDE GEARS. See Gears & Pinions, Rawhide.

READING LAMP BASES. See Bases, Reading Lamp.

REAMERS, Pipe. See Stocks, Dies and Reamers.

RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

KEY
Battery Charging ..... See B
Floor Boxes ..... See F
Welding ..... See W
Machine Tool ..... See W
Watertight, Marine, Mine..... See M
Car Trailer Connection..... See C
Extension ..... See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2996 E. 72nd, Cleveland, O.. F
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. B W M .. E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Arnessen Electric Co., 13 Water, New York M
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.. F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. E
Benjamin Elec. Mfg. Co., Des Plaines, Ill. F .. W M
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Conduletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York M
Crouse-Hinds Co., Syracuse, N. Y. B W
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. F
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. C
Elwell Parker Elec. Co., 4222 St. Clair Ave., N. E., Cleveland, O. B
Fielding. See Stanley & Patterson.
Fountain's. See Jenkins Mfg. Co.
Fuliman Mfg. Co., Latrobe, Pa. F
Fuliman. See Steel City Elec. Co.
General Elec. Co., Merchandise Dept., Bridgeport, Conn. B
Gleason & Co., J. L., 241 Franklin, Boston, Mass. E
H. & H. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. B W
Hessi Co., W. F., 76 Greenwich, New York, N. Y. W M .. E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M
Latrobe. See Fuliman Mfg. Co.
Lexington Electric Products Co., 12 Chapel, Newark, N. J. C
Loeffelholz & Co., Milwaukee, Wis. C
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill. M
Neco. See Novelty Elec. Co.
Nelsage McKenny Co., Seven Front, Seattle, Wash. F
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa. C
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y. E
Preset. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. W M C E
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill. E
Russell & Stoll Co., 53 Rose, New York F B W M .. E
Square D. Co., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
Steel City Elec. Co., Pittsburgh, Pa.. F E
Thomas & Betts Co., 15 Park Place, New York, N. Y. F
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa. M
Walker Bros., 12 E. 41st St., New York, N. Y. F .. E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F B W M
Yale. See Electric Products Co.

RECORDERS, Elapsed Time. See Indicators, Operation.

REDUCERS, Socket. See Socket Reducers.

REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

Bolite Reflector Co., 7500 Sherman Ave., Cleveland, O
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cello, Inc., 96 Prince, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 2935 N. Oakley Ave., Chicago, Ill.
Iaolux. See Wheeler Reflector Co
Jumbo. See Quadrangle Mfg. Co.
Marbelite Art Products Co., 1 N. Robey, Chicago, Ill.
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Oamed. See Overbaugh & Ayers.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 32 S. Peoria, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.

REFRACTORIES, Porcelain. See Cores Resistance Coil.

REFRIGERANTS. See Chemicals, Refrigeration.

REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

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REFRIGERATOR CABINETS

Airlite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
American Refrigerator Corp., Peru, Ind.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Bama Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectriCE Corp., Belding, Mich.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Cavalier. See Tennessee Furniture Co.
Champion Refrigerator Co., 206 Lexington Ave., New York.
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dry-Air. See Baldwin Refrigerator Co.
Eddy & Sons Co., D., 836 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 120 S. La Salle, Chicago, Ill (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Cabinets, Inc., 6504 Euclid Ave., Cleveland, O.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Howe Scale Co., Rutland, Vt.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Kelvinator Corp., Grand Rapids, Mich.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 40 Cooper Square, New York.
Louisville Refrigerator Corp., 4409 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2304 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Plymetl. See Haskelite Mfg. Co.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Rex Mfg. Co., Connersville, Ind.
Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

REFRIGERATOR CONDENSER UNITS. See Condenser Units, Refrigerator.

REFRIGERATOR FITTINGS

Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

REGULATORS, Temperature

American Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y. (Mercury Switch Type.)
American Telethern Co., 1017 Summit, Toledo, O.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa. (Furnace.)
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Bristol Co., Plattes Bridge & Naugatuck Rd., Waterbury, Conn.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Ceaco. See Cobb Electric Appliance Co.
Cobb Electric Appliance Co., 100 Massachusetts Ave., Boston.
Cook Elec. Co., 2700 Southport Ave., Chicago, Ill.
Davis & Daggett Co., 238 Dwight, Springfield, Mass.
D. & T. Manufacturing Co., 3001 La Salle, St. Louis, Mo.
Dunco. See Struthers Dunn, Inc.
Electric Automatic Appliance Co., Denver, Col.
Engelhart, Chas., 90 Chestnut, Newark, N. J.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gifford Heat Control Systems, 1 Broadway, New York.
Gold Car Htg. & Ltg. Co., 220 36th, Brooklyn, N. Y.
Hart Mfg. Co., Hartford, Conn.

SCREW MACHINE PRODUCTS AND SPRINGS
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WILLIAM STEINEN & COMPANY
297 Washington St. Newark, N. J.

Hermansen Elecl. Co., 505 W. 41st, New York, N. Y.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Jewell Mfg. Co., Auburn, N. Y.
Johnson Service Co., 149 Michigan, Milwaukee, Wis.
Lockswitch. See Time-O-Stat Controls Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Marvel. See American Thermostat Co.
Maxwell Corp., 564 W. Adams, Chicago, Ill. (Mercury Switch.)
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Minneapolis, Minn.
Penn Electric Switch Co., Des Moines, Iowa.
Penn Heat Control Corp., 15 & Chestnut Sts., Philadelphia, Pa.
Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill.
Protectostat. See Minneapolis-Honeywell.
Quick Freeze. See Penn Electric Switch Co.
Ranco. See Automatic Reclosing Circuit Breaker Co.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Simplex Heat Regulator, 2958 Pillsbury Ave., Minneapolis.
Snapon. See Tagliabue Mfg. Co.
Struthers Dunn, Inc., 134 N. Juniper, Philadelphia, Pa.
Sure Fire. See Boston Machine Wks.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Time-O-Stat Controls Co., Cramblet Engineering Div., 286 Milwaukee Ave., Milwaukee, Wis.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Webster Elec. Co., Racine, Wis.
White Mfg. Co., 2362 University Ave., St. Paul, Minn.
Wilcolator Co., Newark, N. J.
Wilson-Maeulin Co., 383 Concord Ave., New York, N. Y

REGULATORS, Voltage

American Instrument Co., 774 Girard, N. W., Washington, D. C.
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Marshall Electric Co., Elkhart, Ind.
Rotor. See Ward-Leonard Electric Co.
States Co., 19 New Park Ave., Hartford, Conn.
Ward-Leonard Electric Co., 31 South, Mount Vernon, N. Y. (See also Circuit Breakers and Thermostats.)

RELAYS

American Brown Boveri Elec. Corp., Camden, N. J.
Automatic Switch Co., 154 Grand, New York, N. Y.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Electric B-G Products Co., Ithaca, Mich.
Dunco. See Struthers Dunn, Inc.
General Electric Co., Schenectady, N. Y.
Leach Relay Co., 860 S. Los Angeles, Los Angeles, Cal.
McWilliams. See Electric B-G Products Co.
Roller-Smith Co., 139 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Struthers Dunn, Inc., 138 N. Juniper, Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.

REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE

Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments
Units, Radio. See Radio Circuit Components
Units. See Units, Rods & Grids.
Wire. See Wire Bars.

RESISTORS

Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Ohmite Mfg. Co., 633 N. Albany Ave., Chicago, Ill.
Ward Leonard Electric Co., 31 South, Mount Vernon, N. Y.

RESISTORS. See Units, Rods & Grids.
RESURFACERS, Commutator. See Stones, Commutator, also Tools, Commutator Truing.
REVOLUTION COUNTERS. See Tachometers.

RHEOSTATS.

Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

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automatic and hand
Screw Machine Products
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HARDENING
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PARENT MACHINE & SCREW CO.
50-56 Canal St., Salem, Mass.

Allen-Bradley Co., 494 Reed, Milwaukee L
Biddle, James G., 1211 Arch, Philadelphia L
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.) . . . . . B . . . .
Bradleystat. See Allen-Bradley Co.
Columbia Electric Mfg. Co., 1292 E. 52nd, Cleveland, O. . . . . P . . .
Controlite. See Ward Leonard Elec. Co.
Crown Rheostat & Supply Co., 1908 Maypole Ave., West Chicago, Ill. . . . . P . . .
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. . . . . F B D . . . L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa. . . . . F . . . . . .
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O. . . . . F . . . . . .
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. . . . . B . . . . . .
General Electric Co., Schenectady, N. Y. F L
Hanson-Van Winkle-Munning Co., Matawan, N. J. . . . . P . . .
Holzmuller, C. J., 1108 Howard, San Francisco, Cal. . . . . D . . . .
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. . . . D . . M . .
Kneeller Elec. Co., De Pere, Wis. . . . . F . . . . . .
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago. . . . . F B D . . M L
Optimus. See Hanson-Van Winkle-Munning Co.
New York, N. Y. . . . . M . .
Rubicon Co., 29 W. Sixth, Philadelphia. L
Schaefer Bros. Co., 1059 W. 11th, Chicago . . B . . . . . .
Simplicity. See Cutler-Hammer Mfg. Co.
Robertson, Lee F., Inc., 532 W. 22nd,
Union Elec. Mfg. Co., 934 Juneau Ave., Milwaukee, Wis. . . . . F . . . . . .
Universal. See Ward Leonard Elec. Co.
Vitrohm. See Ward Leonard Elec. Co.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y. . . . . F . . D . . M . .
Watton. See Electric Products Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. . . . . F . . . . . M . .

RINGS Seal. See Packing.

RIVETS

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.
American Brass Co., Waterbury, Conn.
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 85 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.

RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Luzerne Rubber Co., Muirhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panalyte Corp., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

RUBBER, MECHANICAL GOODS

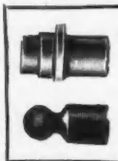
Goodrich Rubber Co., B. F., Akron, O.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Republic Rubber Co., Youngstown, O.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Dept. W., Ashland, O.

RUBBER, SEMI-HARD. See Rubber Mechanical Goods.

RUBBER, Sponge

Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Dept. W., Ashland, O.

RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.



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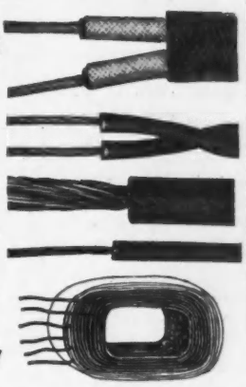

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SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines
SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW DRIVING MACHINES

Vim Electric Tool Co., 149 Broadway, New York, N. Y.

SCREW MACHINE PRODUCTS

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
American Metal Wks., 4865 Stanton Ave., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Brighton Screw & Mfg. Co., 1456 Harrison Ave., Cincinnati, O.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Hanson, Einar B., 17 Hermon, Worcester, Mass.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis.
Interstate Products Corp., 503 Mulberry, Newark, N. J.
Linen & Co., 201 Broad, Providence, R. I.
Mattatuck Mfg. Co., Waterbury, Conn.
Meisel Press Mfg. Co., 3444 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Parent Machine & Screw Co., 50 Canal, Salem, Mass.
Pheoli Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Screw Machine Products Corp., Providence, R. I.
Shimer & Sons, Samuel J., Milton, Pa.
Steiner & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)

Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive

Parker-Kalon Corp., Dept. K., 190 Varick, New York, N. Y.

SCREWS, Machine

Blake & Johnson Co., 1497 Thomaston Ave., Waterville, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., 1818 Broadway, Rockford, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Pheoli Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Screw Machine Products Corp., Providence, R. I.
Strong, Carlisle & Hammond, 1393 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.
SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery

Campbell Elec. Co., Kansas City, Mo.
Carlile & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 555 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES

Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Molded. See Molded Insulation.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric

Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 630 West Jackson Blvd., Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th St., New York, N. Y.
Borghese. See Hall, Chas.
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Fuss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Fusilite. See Fuss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)

Fair Haven Marble & Marbleized Slate Co.
Fair Haven Vermont
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PORTLAND-MONSON SLATE CO. TRADE MARK PORTLAND, ME.
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for Electrical Purposes, Natural Black, Oil Finish
Quarries: Monson, Maine
Office, Portland, Maine

Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chints.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Ideatite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Frankford Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 18 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Tris Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman & Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

SHADES AND DOMES

Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 234 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.
SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oamco. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.
SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.
SHEARS, Metal Cutting. See Shears, Power.
SHEARS, Rotary. See Shears, Power.

SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEARS, Power

Niagara Machine & Tool Wks., 637 Northland, Buffalo, N. Y.
SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket

Chase Brass & Copper Co., Waterbury, Conn.
Dallas Brass & Copper Co., Div. of Revere Copper & Brass Inc., 820 Orleans, Chicago, Ill.
Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn. (Miniature.)
SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."
SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire

Baker & Co., Inc., 54 Austin, Newark, N. J.
General Plate Co., Attleboro, Mass.
Gilby Wire Co., Riverside Ave., Newark, N. J.

Handy & Harman, 57 William, New York, N. Y.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.
SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SIGN ELECTRODES, Gas. See Electrodes for Gas Signs.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE

For Switchboard Slabs and Barriers.
Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Monson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.
SLEEVE-BEARINGS. See Bearings and Bushings.
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator

(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burton & Rogers Co., 357 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3242 Monroe, Toledo, O.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
South Bend Lathe Works, 425 E. Madison, South Bend, Ind.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.
SNAP SWITCHES. See Switches, Snap

SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 152 W. 23rd, New York, N. Y.
Kirchberger & Co., Inc., 1435 37th, Brooklyn, N. J.
Lin-Stun. See Westinghouse.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
SOCKET LININGS. See Linings, Socket
SOCKET SHELLS. See Shells, Screw Socket.
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain Attachments

Chain Links, Chain Adjusters, Acorns, Extensions, Insulated Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 118 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Palsta. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hathoway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn. (Acorns.)
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insu-

SOCKET REDUCERS

Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cen-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 79 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart & Hegeman Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 50 Boylston, Boston, Mass.
SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key	See K
Composition	See W
Metal Shell	See B
Porcelain	See A
Pull Chain	See P
Push Through	See T
Sign Receptacles	See A

A. B. C Sew Leviton Mfg. Co.
Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. . . . . A
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo. . . . . W
Alabax. See Arrow Elec. Co.
Alcor Mfg. Co., 4605 W. Madison, Chicago, Ill. C
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill. . . . . A
Armstrong & White, 8th and Liberty Ave., Pittsburgh, Pa. . . . . A
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. M C K T P B A
Arrogrip. See Arrow Elec. Co.
A. & W. See General Outdoor Adv. Co.

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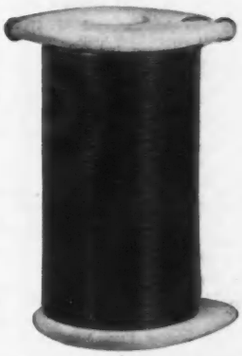

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Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport ..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. .... M . . K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. ....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M . . K T . . B A
Crouse-Hinds Co., Syracuse, N. Y. ... A W . . . . . .
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee, Wis. .... K T . . B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. .... P B . .
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. .... C . . . . . .
Federal Electric Co., 8700 S. State, Chicago, Ill. .... A
Flute. See Pass & Seymour.
Flutelier. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. ..... M C . . . . . B . .
Gaynor Elec. Co., Stratford, Conn. .. . . . . A
General Elec. Co., Merchandise Dept., Bridgeport, Conn. ..... M C K T P B A
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... M C K T P B A
Hoosick Falls Radio & Elec'l Parts Mfg. Co., Hoosick Falls, N. Y. ..... W . . . . . .
Horan Co., E. S., 550 Monroe, Carlstadt, N. J. .... A
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) ....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. .... A
Leviton Mfg. Co., 236 Nowell, Brooklyn, N. Y. ..... M C K . . P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. .... P B A
Majestic Elec. Mfg. Co., 806 N. 13th, St. Louis. (Lamp Receptacle.) .... A
Molded Socket Corp., Railroad, Pa. .... K . . . . . .
Multi Elec'l Mfg. Co., 1840 W. 14th, Chicago, Ill. .... A
Multilok. See Circle F Mfg. Co.
Newgard. See Multi Elec'l Mfg. Co.
New Wrinkle. See Bryant Elec.
Neark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Pauiding, John I., New Bedford, Mass. .... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ... . A
Propp Co., M., 524 Broadway, New York, N. Y. ....
Quick Catch. See Hubbell, Inc.
Royal. See Sears, Henry D.
Ryan Appliance Co., 117 Mulberry, Trenton, N. J. ..... W . . . . . A
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 80 Berkeley, Boston
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Sieman Co., Bridgeport, Conn. ....
Tapiet Mfg. Co., 3709 Powelton Ave., Philadelphia, Pa. .... A
Titan. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. .... A
Union Insul. Co., Parkersburg, W. Va. .. . . . . A
United States Elec. Mfg. Corp., 223 W. 14th, New York, N. Y. .... P . . B . . W
U. S. Electric Co., 20 Chambers, Trenton, N. J. .... A
Walco. See Leiser & Co., W. A.
Waterbury Button & Moulding Co., Waterbury, Conn. ....
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) .... P B . .
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. .... P . . .
Wood Electric Co., C. D., 565 Broadway, New York. (Sign Receptacles.) .... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

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Gardiner Metal Co., 1866 W. Lake, Chicago, Ill.
Kester Solder Co., 1212 Wrightwood Ave., Chicago, Ill.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
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Philadelphia Solder Co., 16th & Indiana Ave., Philadelphia, Pa.
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Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator
Pots. See Melting Pots & Ladles.
Tools. See Torches and Furnaces.

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Anchor. See Garden City Laboratory.
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Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
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Callahan & Co., Geo., 218 Front, New York. (Fluid.)
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Challenge. See Highland Electro Chemical Co.
Conductalute. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
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Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Firth Radio Corp., 35 Beaver, New York, N. Y.
Fluxite. See Monarch Products Co.
Garden City Laboratory, 300 W. Adams, Chicago, Ill.
General Elec. Co., Bridgeport, Conn. (Paste).
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Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
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Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
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Perfecto. See Firth Radio Corp.
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Redens. See Reade Mfg. Co.
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Ruby (Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salbrick. See American Solder & Flux Co.
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. (Paste.)
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
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Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
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SPAGHETTI. See Tubing, Varnished Fabric.

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SPEED INDICATORS. See Tachometers.

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Airway. See Binks Spray Equip. Co.
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Babco. See Simons Paint Spray Brush Co.
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Paint-O-Mister. See Atomister Corp.
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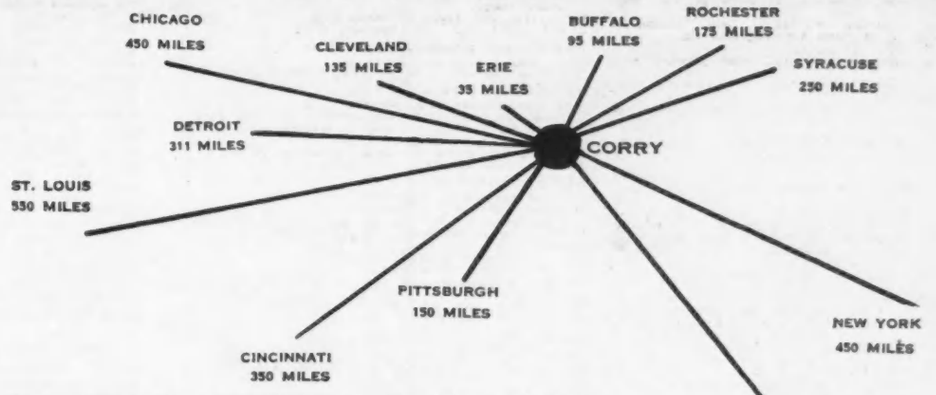

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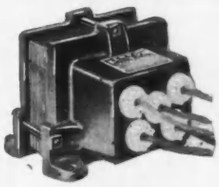

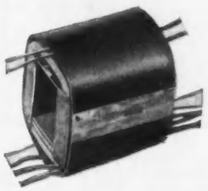

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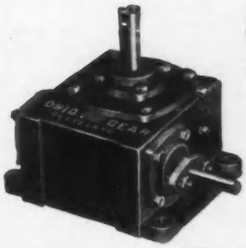

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Cleveland Wire Spring Co., Cleveland, O.
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Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
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Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Flexo Spring Mfg., Inc., 44 South First, Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Mattatuck Mfg. Co., Waterbury, Conn.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Hunter Pressed Steel Co., Lansdale, Pa.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1668 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Raymond Mfg. Co., Corry, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Young Industries, Inc., L. A., Detroit, Mich.

STAMPED BOXES. See Cabinets, Sheet Steel.

STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel
Heavy Stamping and Drawing.
Acklin Stamping Co., 1925 Nebraska, Toledo, O.
American Stamping Co., 978 E. 64th, Cleveland, O.
Bartlett-Thompson Co., 67 Sudbury, Boston, Mass.
Bassett Corp., 1002 Oswego St., Utica, N. Y.
Challenge Stamping & Porcelain Co., Grand Haven, Mich.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, 1392 St. Paul Ave., Milwaukee.
Hubbard & Co., Pittsburgh, Pa.
Janney, Jr., Joseph A., 1421 Chestnut St., Philadelphia.
Lansing Stamping Co., Lansing, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem Ohio. (Vitreous Enameled)
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Truscon Steel Co., Youngstown, O.
United States Stamping Co., Moundsville, W. Va.

STAMPINGS, Small
Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
American Stamping Co., 978 E. 64th, Cleveland, O.
Arrow Automatic Products Corp., 27 Vestry, New York, N. Y.
Barnes Co., Wallace, Bristol, Conn.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Chase Brass & Copper Co., Waterbury, Conn.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Elco Tool & Screw Corp., Rockford, Ill.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, 1392 St. Paul Ave., Milwaukee.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Plano, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Imperial Electrical Co., Union City, Ind.
Krischer's Mfg. Co., 259 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mattatuck Mfg. Co., Waterbury, Conn.
McDowell Mfg. Co., Millvale Sta., Pittsburgh, Pa.
Mechanics Tool & Stamping Co., 7 Summer, Worcester, Mass
Monowatt Electric Corp., 24 W. 40th, New York, N. Y.
Mutual, See Bull Dog Elec. Products Co.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Precision Metal Workers, 3100 Carroll Ave., Chicago, Ill.
Premax Products, Inc., 230 Tenth, Niagara Falls, N. Y.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Signal Elec. Mfg. Co., Menominee, Mich.
Sosa Mfg. Co., Roselle, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United Stamping & Mfg. Co., Cleveland, Ohio.
United States Stamping Co., Moundsville, W. Va.
Valley Appliances, Inc., 634 Lexington Ave., Rochester, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button & Moulding Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Western Cartridge Co., East Alton, Ill.
Zierick Machine Wks., F. R., 68 E. 131st St., New York, N. Y.

STANDS, Armature
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Oman, David W., 43 Royalstone Ave., Minneapolis, Minn
Pearless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).
STEATITE. See Cores, Resistance Coil.
STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances
Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet
Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.
Reed Co., Jr., David, 85 Adams, Brooklyn, N. Y.
Swedmag. See Reid Co., Jr., David.

STEEL SHEETS
Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armco. See International Corp., Middletown, O.
Armeiec. See Empire Steel Corp.
Central Alloy Steel Corp., Massillon, O.
Cyclops Steel Co., Titusville, Pa.
Dyneiec. See Empire Steel Corp.
Empire Steel Corp., Mansfield, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Manelec. See Empire Steel Corp.
Meteiec. See Empire Steel Corp.
Newport Rolling Mill Co., Newport, Ky.
Poleiec. See Empire Steel Corp.
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Traneiec. See Empire Steel Corp.
Unitoy. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers
Hall-Will, Inc., Twelfth & Cranberry, Erie, Pa.
Red-E-Hail. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., Toledo, O.

STONES, Commutator
Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel
Angle Steel Stool Co., Plainwell, Mich.
Chicago Wire Chair Co., 615 N. La Salle, Chicago, Ill.
Royal Metal Mfg. Co., 1140 South Michigan Ave., Chicago.
STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.
STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL
(Hot and Cold Roll).
Acme Steel Co., 2832 Archer Ave., Chicago, Ill. (Hot & Cold).
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. (Cold).
Athenia Steel Co., 135 William, New York, N. Y. (Cold.)
Barnes Co., Wallace, Bristol, Conn. (Hot.)
Central Alloy Steel Corp., Massillon, O. (Hot.)
Griffin Mfg. Co., Huron & Cherry, Erie, Pa. (Cold.)
Laclede Steel Co., 8th & Olive Sts., St. Louis, Mo. (Hot.)
Latrobe Electric Steel Co., Latrobe, Pa. (Hot & Cold.)
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Sharon Steel Hoop Co., Sharon, Pa. (Hot.)
Stanley Wks., New Britain, Conn. (Hot & Cold.)
Steel and Tubes, Inc., Cleveland, O. (Hot & Cold.)
Superior Steel Corp., Union Trust Bldg., Pittsburgh, Pa. (Hot & Cold.)
Thomas Steel Co., Warren, Ohio.
West Leechburg Steel Co., Farmers Bank Bldg., Pittsburgh, Pa. (Hot & Cold.)

STRIPPERS, Wire
Acme. See A. Laubscher.
Artos Engineering Co., 115 Brown, Milwaukee, Wis. (Cutting, Stripping and Measuring).
Austin Co., M. B., 108 S. Desplaines, Chicago, Ill.
Carlander, Henry, 508 W. 146th, New York, N. Y.
Colonial-Premier Co., 229 W. Ohio, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
France Mfg. Co., 10306 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Hartman. See Service Sales & Mfg. Co.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Perfection. See Weber Machine Corp.
Pyramid Products Co., 2311 S. State, Chicago, Ill.
Service Sales & Mfg. Co., 17005 Melgrave Ave., Cleveland, Ohio.
Speedcraft. See Wire Stripper Co.
Thomas Steel Products Co., Warren, Ohio.
Weber Machine Corp., 33 S. Water, Rochester, N. Y.
Wire Stripper Co., 507 Erie Bldg., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).
SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.

PEAK LOAD
MERCURY SWITCHES
E. Machlett & Son
50 William St., Long Island City, N. Y.

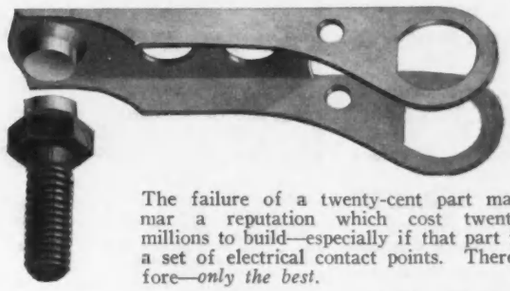
SWITCHBOARD OPALS. See Lenses.
SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.
SWITCH (Switches)
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting, Magnetic Type. See Controllers.
Motor Starting, Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife
Cut-Out Switches.
Anti-Wood. See Keil & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2301 S. Halsted, Chicago, Ill.
Jefferson Electric Co., 1503 S. Laflin, Chicago, Ill.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Crown. See Edwards & Co., Inc.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Div.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Trenton, N. J.
Just. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-P Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Majestic Elec. Mfg. Co., 80 N. 12th St., St. Louis, Mo.
Manhattan Elecl. Supply Co., 510 Sixth Ave., New York.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury
(For Temperature Control Apparatus.)
Con-Tac-Tor. See Time-O-Stat Controls Co.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Dunco. See Struthers Dunn, Inc.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Electric Vapor Lamp Co., 833 Adams, Hoboken, N. J.
Leland Electric Co., Dayton, O.
Kontax. See Leland Electric Co.
Kontroler. See Leland Electric Co.
Machlett & Son, 50 William, Long Island City, N. Y.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Struthers Dunn, Inc., 134 N. Juniper, Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.

SWITCHES, Motor Starting
Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
Aurora Steel Products Co., Aurora, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 216 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
E. W. See Trumbull Elec. Mfg. Co.
F. A. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Large-Dali Mfg. Co., 311 N. Tenth, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2987 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Robbins & Myers, Inc., Springfield, O.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.

CONTACTS
that make and break
SALES



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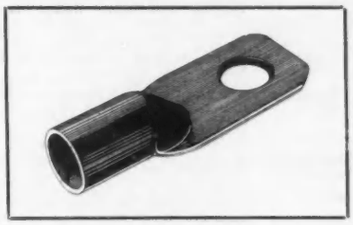

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OVENS

SWITCHES, Meter Starting—Continued
Safelock. See Westinghouse Elec. & Mfg. Co.
Schmuckler & Sons, 2253 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson & Co., C. J., 213 W. Austin Ave., Chicago, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 869 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 126 Liberty, New York, N. Y.
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Struthers Dunn, Inc.
Electric Valve Mfg. Co., 64 Murray, New York, N. Y.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Div. of Square D Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Lincoln Elec. Co., Coit Rd. & Kirby Ave., Cleveland, O.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
South Bend Current Controller Co., South Bend, Ind.
States Co., 19 New Park Ave., Hartford, Conn.
Struthers Dunn, Inc., 134 N. Juniper, Philadelphia, Pa.
Takamine Corp., 208 Hawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

KEY

Feed Through ..... See p
Fixture (Canopy, Candelabra and Key Arm) ..... See F
Flush ..... See f
Lever, Toggle, Tumbler ..... See L
Pendant ..... See p
Push Button ..... See P
Rotary ..... See R
Surface ..... See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo. ? . . . . . .
Anylite Elec. Co., Ft. Wayne, Ind. . . . . L . .
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. . . f sp P R L F
Arrow Head. See Arrow Elec.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. . . . . f p P . . . F
Best. See United States Elec. Mfg. Corp.
Brascolite. See Guth & Co., Edwin.
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa. . . . . f . . . . . .
Bridgeport Switch Co., 209 Center, Bridgeport, Conn. . . . . L F
Bryant Elec. Co., Bridgeport, Conn. . . . . f sp P R L F
B. S. Co. See Bridgeport Switch Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn. . . . . F
Commercial. See Gaynor Electric Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. . . . . p P R L F
Crouse-Hinds Co., Syracuse, N. Y. . . . . L . .
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. . . . . P . . . L . .
Diamond H. See Hart Mfg. Co.
Dugle. See Bryant Elec. Co.
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill. . . . . F
Gaynor Elec. Co., Stratford, Conn. . . . . f . . . . L . .
General Elec. Co., Bridgeport, Conn. . . . . f sp P R L F
Glo-Guide. See Bryant Elec. Co.
Gold Star Push Switch. See Hart & Hegeman.
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo. . . . . .
Hart Mfg. Co., Hartford, Conn. . . . . f sp P R L . .
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. (Door Bolt Control) f sp P R L F
Hart. See Hart & Hegeman.
H. & H. See Hart & Hegeman Mfg. Co.
Hubbell, Inc., Harvey, Bridgeport, Conn. . . sp . . . . L F
Jost. See Morse, Frank W.
Keil & Son, Francis, 401 E. 163rd, New York, N. Y. . . . . f . . P . . . . .
Leviton Mfg. Co., 236 Newell, Brooklyn . . . . . F
Levolier. See McGill Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. . . . . f . . . . . L F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y. . . . . L F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y. . . . . s . . B . . .
Morse Co., Frank W., 291 Congress, Boston . . . P . . . . .
National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg. See Hubbell, Harvey, Inc.
Operite. See Morse Co., Frank W.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. . . . . f sp P . . L F
Paulding, John L., New Bedford, Mass. . . . f s P . . . . .
Pen Tap. See Beaver Mfg. Co.
Perkins. See Bryant Elec. Co.
Pilot Radio & Tube Corp., 323 Berry, Brooklyn, N. Y. . . . . L . .
Pilotoggle. See Pilot Radio & Tube Corp.
Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Rodale Mfg. Co., 200 Hudson, New York p . . . . . W
Sears, Henry D., 80 Boylston, Boston . . f sp P R L F
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. . . . . P . . . . .
Snapit. See Marks Products Co.
Spartan. See Bryant Elec. Co.
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill. . . . . f . P R L . .
Trigle. See Bryant Elec. Co.
Tumbolier. See Hart & Hegeman.
Twi-Lite. See McGill Mfg. Co.

United States Elec. Mfg. Corp., 232 W. 114th, New York, N. Y. . . . . f . . . . . .
Victor. See Ketl & Son, Francis.
Washington. See Gaynor Electric Co.
Weber. See Sears, Henry D.
Wesirita. See Morse, Frank W.
Yankee. See Bryant Elec. Co.

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.

Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., Kent, O.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Penn Electric Switch Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.

SWITCHES, Tank

Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Tranern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn.
Penn Elec. Switch Co., 20th & Walnut, Des Moines, Ia.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Astrachron. See Gem Engineering Co.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Buckeye Time Switches, Inc., 1557 St. Clair Ave., Cleveland, O.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Con-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 126 Liberty, New York, N. Y.
Eureka Tool & Machine Co., 43 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
Gem Engineering Co., Hempstead, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York. N. Y.
Horolectrical Corp., 216 W. 14th, New York, N. Y.
Jewel. See Time Switch Sales & Service.
Knowles, W. E., 2869 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland.
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Radio Owl, 2269 E. 51st, Los Angeles, Cal.
Radio Switchman. See R-V Mfg. Co.
Reliance Automatic Ltg. Co., 1925 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles.
Robbins & Myers Co., Springfield, O.
Ross Safety Switch Corp., 1 E. 42nd, New York, N. Y.
R-V Mfg. Co., Marshfield, Mass.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Stromberg Electric Co., 222 W. Erie, Chicago, Ill.
Thompson Clock Co., H. C., Bristol, Conn.
Time Switch Sales & Service, 1841 Euclid Ave., Cleveland.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Walser Automatic Timer Co., 342 Madison Ave., New York.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.

Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Durant Mfg. Co., 655 Buffum, Milwaukee, Wis.
Electric Tachometer Corp., Spring Garden & Broad St., Philadelphia, Pa.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stanton Ave., Philadelphia, Pa.
Misener Mfg. Co., 326 E. Washington, Syracuse, N. Y.
Productimeter. See Durant Mfg. Co.
Standeo. See Stricht & Co.
States Co., 19 New Park Ave., Hartford, Conn.
Stricht & Co., H. H., 13 Park Row, New York, N. Y.
Weeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Western Elect. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.
Zernickow Co., O., 15 Park Row, New York, N. Y.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 185 Grand, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brecklin Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Premax Products, Inc., 230 Tenth, Niagara Falls, N. Y.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button & Moulding Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

TAMPING TOOLS, COIL. See Tools, Commutator Truing.

TANK SWITCHES. See Switches, Tank.

TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Corp., New York, N. Y.

Matthews & Co., Jas. H., 3942 Forbes, Pittsburgh, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk; Tape, Sleeving, Webbing.

Alfalfa. See Burrell Belting Co.
Anchor Webbing Co., 300 Brook, Pawtucket, R. I. (Cotton, Silk).
Awabee. See Anchor Webbing Co.
Armaline. See Burrell Belting Co.
Burrell Belting Co., 413 S. Hermitage Ave., Chicago, Ill.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., L. H., Cottman & Keystone Sts. (Tacony), Philadelphia, Pa.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Candee. See Ackurate Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okonite Co.
Dunton Co., M. W., 676 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Firestone Tire & Rubber Co., Akron, O.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York, N. Y.
Imperv. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johns-Manville Corp., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Manson. See Okonite Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relic. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.
Sitco. See Superior Insulation Tape Co.
Slipknot. See Plymouth Rubber Co.
Star. See Sullivan & Sons Mfg. Co., J.
Sticka. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 5044 Lambdin Ave., St. Louis.
3-Plex. See Holfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Usco. See United States Rubber Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric

Acme Wire Co., New Haven, Conn.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Stico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridlon Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.
Seifert, H. R., 315 E. Washington, Syracuse, N. Y. (Automatic.)

TAPING MACHINES, Wire

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.

TAPS. See Stocks, Dies and Reamers.

TENSION DEVICES. Coil Wire. See Racks, Wire Reel

TENSION MACHINES, Band Wire

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Pearless. See Electric Service Supplies Co.

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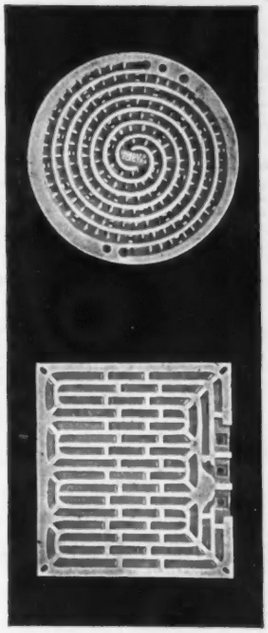

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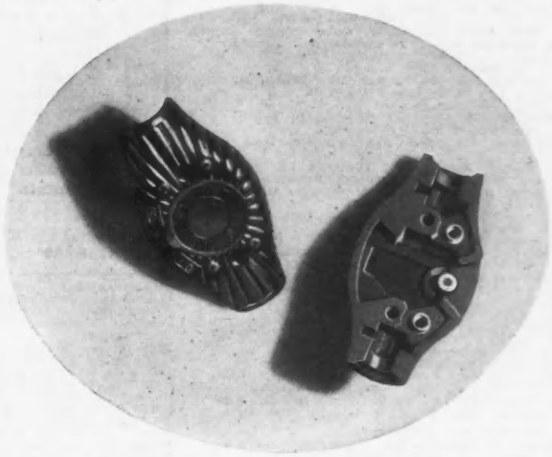

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Burton-Rogers Co., Boston, Mass.
Cabeing. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 194 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2236 Wabansia, Chicago, Ill.
K. E. M. See Kulier Elec. Mfg. Co.
Kulier Elec. Mfg. Co., 575 Pierce Ave., Long Island City
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3361 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Petersen Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury Button & Moulding Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.
Zierick Machine Wks., F. R., 6 Howard, New York.

TEST BENCHES, Armature
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Hobart Bros. Co., Troy, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Appliance Corp., Rochester, N. Y.
Pence & Soo, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill

TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil
(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co., also Case Elec.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Case Elec. Co., Marion, Ind.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St Louis Mo
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland.
Electrotest. See Comparometer Company.
Ev-Ri-Test. See Weidenhoff, Joseph.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 225 Varick, New York, N. Y.
Herald Elec. Co., 29 East End Ave., New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kietzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Appliance Corp., Rochester, N. Y.
Oman, David W., 43 Royalstone Ave., Minneapolis, Minn.
Paneltest. See Allen Elec. & Equip. Co.
Portometer. See Allen Elec. & Equip. Co.
Portostat. See Allen Elec. & Equip. Co.
Presto. See Metal Specialties Mfg. Co.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Sherwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill
States Co., 19 New Park Ave., Hartford, Conn. (Transformer Test Table)
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill

TESTING LABORATORIES
Baker & Co., Inc., 54 Austin, Newark, N. J.
Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
National Elec'l Inst. Co., 182 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.

THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL
Baker & Co., Inc., 54 Austin, Newark, N. J.
Chace Valve Co., W. M., 1600 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
General Plate Co., Attleboro, Mass.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Interstate Products Corp., 503 Mulberry, Newark, N. J.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J.
Venbur. See Coffin Mfg. Co., B. F.
Wilco. See H. A. Wilson Co
Wilson Co., H. A., Newark, N. J.

THERMOSTATS
American Thermostat Co., 236 Jeliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa
Burke Controller Co., 349 Lexington Ave., New York, N. Y
Cobb Elec. Appliance Co., 100 Massachusetts Ave., Boston.
Cramblett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
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Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Interstate Products Corp., 29 Commercial, Newark, N. J
King. See Electric Heat Control Co.
Klixon. See Westinghouse Electric & Mfg. Co.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 361 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Sovutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Struthers Dunn, Inc., 134 N. Juniper, Philadelphia, Pa.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Taglibue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teeple Co., L. R., 540 E. 9th, Portland, Ore.
Thermoelectric. See Bishop & Babcock Sales Co.
Time-O-Stat Controls Co., Elkhart, Ind.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., Newark, N. J.

TIGHTENERS, Commutator
Elmes Engineering Works, Chas. F., 230 N. Morgan, Chicago, Ill.

TIME SWITCHES. See Switches, Time.

TIN FOIL
Lehmaier, Schwartz & Co., 521 W. 25th, New York, N. Y.
United States Foil Co., 30th & Grand Sts., Louisville, Ky.

TINNING TANKS, WIRE. See Wire Manufacturing Machines.

TINSEL. See Wire, Insulated.

TINSEL, Cord and Thread
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Diamond Braiding Mills, Chicago Heights, Chicago, Ill.
Frank & Co., M. J., 15 W. 39th St., New York, N. Y.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Ey-Sil Mfg. Co., Revere, Mass.
Kilo Co., 3 E. 23rd, New York, N. Y.
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia.
Lees Mfg. Co., 320 Broadway, New York, N. Y.
Montgomery Co., J. R., Windsor Locks, Conn.
Rockbestos Products Corp., 365 Nicoll, New Haven, Conn.
Springfield Wire & Tinsel Co., Springfield, Mass.
Taft Co., R. C., 174 N. Franklin, Chicago, Ill.

TIPS, Cord
Duro. See McEvoy, C. H.
McEvoy, C. H., 426 Broadway, Lowell, Mass.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Nordon & Co., S. 180 S. Water, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.

TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Coil Tamping
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.

TOOLS, Commutator Truing
Acme. See Geen Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery
Battery Euipment & Supply Co., 7530 Greenwood Ave., Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
Cleveland Steel Products Corp., 7306 Madison Ave., Cleveland, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
General Elec. Co., Schenectady. (Lead Burning Outfits.)
Heet-A-Knife. See Op-al Elec. & Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)

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Pyratip. See General Elec. Co.
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES
Acetylene, Alcohol, Gasoline, Kerosene.
Berns Co., Otto, Newark, N. J.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill
Lasher-Weeber Co., 261 Franklin, Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Staynalite. See Klein & Sons, Mathias.

TORPEDO Cord. See Twine.

TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS
Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Low & Intermediate Voltage.

TRANSFORMERS, Low and Intermediate Voltage
For Oil Burners, Gas Tube Signs, and other special purposes.
American Bosch Magneto Corp., Springfield, Mass.
American Transformer Co., Newark, N. J.
Campbell Elec. Mfg. Co., Lynn, Mass.
Concourse Electric Co., 294 E. 137th, New York, N. Y.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Jefferson Electric Co., 1500 S. Laflin, Chicago, Ill.
K-W Ignition Corp., 2811 Chester Ave., Cleveland, Ohio.
Manhattan Elect. Supply Co., 510 Sixth Ave., New York.
Sergel Electric Co., 89 W. Water, Milwaukee, Wis.
Standard Transformer Co., Warren, O.
Uptigraff Mfg. Co., R. E., First National Bank Bldg., Pittsburgh, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power
Controller drive giving a variety of speeds for use in connection with coil taping machines.
Electric Service Supplies Co., 17th & Cambria Sts. Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.

TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel
Angle Steel Stool Co., Plainwell, Mich.

TRUING Devices, Commutator. See Tools, Commutator.

TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Aluminum. See Aluminum.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Nickel. See Tubing, Brass & Copper.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Porcelain. See Porcelain.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings
Cleveland Container Co., 10619 Beres Rd., Cleveland, O.
Climax Tube Co., Mystic, Conn.
Klimaxcore. See Climax Tube Co.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Paper Tube Co., 1718 N. Damen Ave., Chicago, Ill.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp. Pittsburgh, Pa
Stone Paper Tube Co., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper
American Brass Co., Waterbury, Conn.
Anaconda. See American Brass Co.
Baltimore Tube Co., 1301 Wicomico, Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
Bull Dog. See National Elec. Products Corp.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
Cook, Dunbar Smith Co., 85 Sprague, Providence, R. I
Dallas Brass & Copper Co., Div. of Revere Copper & Brass, Inc., 320 Orleans, Chicago, Ill.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Michigan Copper & Brass Co., Div. of Revere Copper & Brass, 8851 Jefferson Ave., Detroit, Mich.
Mueller Brass Co., Port Huron, Mich
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
National Elec. Products Corp., Pittsburgh, Pa.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y
Rome Hollow Wire & Tube Co., Div. of Revere Copper & Brass, Inc., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa
Summerill Tubing Co., Bridgeport, Pa. (also Nickel)
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1431 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic
(Flexible Tubing.)
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Hose Co., Waterbury, Conn.
American Metal Moulding Co., 146 Coit St., Irvington, N. J.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Auto-Brassflex. See National Metal Elec. Products Corp.
Auto-Steelflex. See National Metal Elec. Products Corp.
Breeze Corp., Inc., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y
Flexo Spring Mfg. Inc., 34 South First, Brooklyn, N. Y.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co
Sleeper & Hartley, Inc., Worcester, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.

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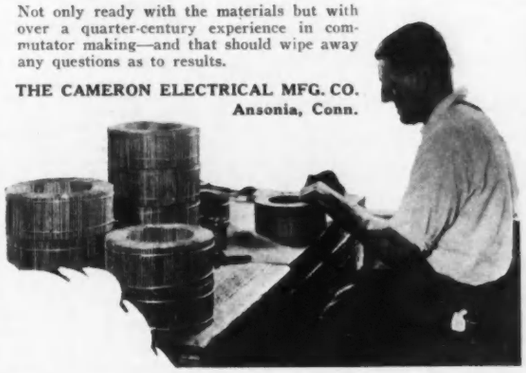

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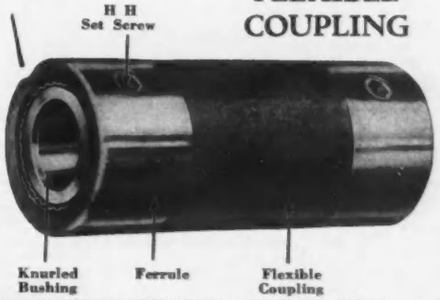

TUBING, Rubber—Continued
United Metal Hose Co., 124 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBING, Rubber
Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Canfield Rubber Co., 702 Railroad Ave., Bridgeport, Conn.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Rubber-Vac. See Kinter Electric Corp.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.

TUBING, Varnished Fabric
Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Wire Corp., 520 Broadway, New York, N. Y.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co., Merchandise Dept., Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insulite Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.

TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel

TURNING TOOLS, COMMUTATOR. See Tools, Commutator Truing.

TWINE, Armature Winding; Torpedo Cord
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.

UNDERCUTTERS, Mica. See Slotting Machines & Tools Commutator.

UNITS, Refrigerator Condenser. See Condenser Units, Refrigerator.

UNITS, Rods and Grids, Resistance
Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Electric Heater Co., 1708 Race, Philadelphia, Pa
Bradleyunit. See Allen Bradley Co.
Buffalo Products Co., Broome & Lafayette Sts., New York
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Chromalox. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 58 Holten, Danvers, Mass.
Daric Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Dur-ristor. See Cutler-Hammer, Inc.
Eagle Elec. Mfg. Co., 79 Hall, Brooklyn, N. Y.
Edgerest. See Industrial Controller Div.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5618 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Erie Resistor Corp., 644 W. Twelfth, Erie, Pa.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Witlow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., 597 West Main, Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Hexwound. See Monitor Controller Co.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa (Radio Resistance.)
Krischer's Mfg. Co., 255 Calyer, Brooklyn.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J.
Louthan Mfg. Co., East Liverpool, O.
Marks. Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill
Ohmite Mfg. Co., 633 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 957 W. 30th, Indianapolis, Ind
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa
Poloron Elec. Mfg. Corp., 26 Waverly Pl., New York, N. Y.
Presto Products Co., 520 Broadway, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
Serco. See Automatic Electric Heater Co.
Smith & Co., T. C., 2915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Stupakoff Laboratories, 6427 Hamilton Ave., Pittsburgh, Pa
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y
Vitrohm. See Ward Leonard Elec. Co.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., 31 South, Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlor Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
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Wiegand Co., Edwin L., 7530 Thomas Blvd., Pittsburgh, Pa
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VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.

VACUUM DRYING & IMPREGNATING OVENS. See Ovens, Industrial.

VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated
Anderson & Co., C. J., 212 W. Austin Ave., Chicago, Ill
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Crane Co., 836 Michigan Ave., S., Chicago, Ill.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee
Electric Steam Radiator Co., 513 Stewart, Seattle, Wash
Electric-Valve Mfg. Co., 68 Murray, New York, N. Y.
Fabrics Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Michigan Metal Products Co., Battle Creek, Mich.
Nacco Mfg. Co., 1482 Clara Ave., St. Louis, Mo.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Sentinel. See Electric Steam Radiator Co.
Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Time-O-Stat Controls Co., Elkhart, Ind.
Victor. See Lunkenheimer Co.
Zeco. See Zisch Engineering Corp.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)

VARNISH. See Paint, Varnish, Lacquer.

VARNISHED TAPE. See Tape, Varnished Fabric.

VARNISHED TUBING. See Tubing, Varnished Fabric.

VOLT BOXES. See Instruments, Laboratory Standard.

VOLTMETERS. See Instruments.

VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION
American Insulating Machinery Co., 519 Huntington Ave. Philadelphia, Pa.
Biggs Boiler Works Co., Akron, Ohio.

WASHERS, FIBRE. See Fibre.

WASHERS, Leather
Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich

WASHERS, Lock
Hobbs Mfg. Co., Worcester, Mass.
Keystone. See Positive Lock Washer Co.
National Lock Washer Co., Newark, N. J.
Positive Lock Washer Co., Ave. A & Miller, Newark, N. J
Shakeproof Lockwasher Co., 2501 N. Keeler Ave., Chicago.
St. Louis Malleable Casting Co., 7701 N. Conduit Ave., St. Louis, Mo.

WASHERS, Metallic
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nut Mfg. Co., 2515 Cullerton, Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.

WATTMETERS. See Instruments.

WAX AND COMPOUNDS
Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound.....See C
Ackurate Rubber Co., 25 Beaver, New York, N. Y. W . . .
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago. . . . S . .
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. . . . C
Biwax Corp., 208 S. La Salle, Chicago, Ill. . . . W S . .
Black Nego. See Williams Co., F. M.
Brand & Co., William, 268 Fourth Ave., New York, N. Y. . . . W . . .
Bulls-Eye. See Zinsser & Co.
Cablelene. See Vacuum Oil Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S' . .
Cerowax. See Vacuum Oil Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston. . . . C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. . . . W S . .
Dolph Co., John C., 168 Emmet, Newark, N. J. W . . .
Di Electric Puttie. See Ackurate Rubber Co.
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Bridgeport, Conn. . . . W . . .
George Co., P. D., St. Louis. . . . W . . .
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O. . . . W S . .
Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., Div. of General Cable Corp., 5133 Wesson Ave., Detroit. . . W . . .
Hercules Powder Co., 975 Market, Wilmington, Del. (Wood Rosin) . . . S . .
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York. . . . W . .
Insulation. See Vacuum Oil Co.
Knox & Morse Co., 80 Freeport, Boston, Mass. . . . W S . .
Laverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. . . . C

Mineralac Elec. Co., 1045 Washington Blvd., Chicago, Ill. . . . W . . .
Mitchell-Rand Mfg. Co., 19 Vesey, New York. . . . W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind. . . . W . . .
National Wax Co., 189 W. Madison, Chicago, Ill. . . S . .
Nu-Blac. See Star Porcelain Co.
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Sub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. . . . W . . .
Sherwin-Williams Co., Cleveland, O. . . . W . . C
Standard Varnish Wks., 433 4th Av., New York. . W . . .
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. . . . W S . .
Star Porcelain Co., Trenton, N. J. . . . W . . C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Indiana Trust Bldg., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. . . . W S . .
Vacuum Oil Co., 61 Broadway, New York, N. Y. W . . .
Warner-Quinlan Co., 2 Park Ave., New York, N. Y. . . . C
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. . . . S . .
Williams Co., F. M., 1238 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y. . . . W . . .

WEDGE DRIVERS. See Tools, Commutator.

WELDS, Lamp Lead-in. See Filaments, Incandescent

WELDING AND CUTTING OUTFITS
Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme Elec. Welder Co., 1850 W. Fulton, Chicago, Ill.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Co., Inc., 720 Washington, Buffalo
Almane. See Allan Mfg. & Welding Co., Inc.
Alternare. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Economy Electric Products Co., 2400 Woodland Ave., Cleveland, O.
Eisler Electric Corp., 756 S. 13th, Newark, N. J.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fleet-Weld. See Lincoln Elec. Co.
Fusion Welding Corp., 10257 Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y.
Hansen. See Northwestern Mfg. Co.
Hollup Corp., C. H., 3333 W. 48th Place, Chicago, Ill.
Lincoln Electric Co., Coit Rd. and Kirby Ave., Cleveland.
Lundy Co., E. A., Fulton Bldg., Pittsburgh, Pa.
McAdams Co., J. C., New Britain, Conn.
Nigg Engineering Corp., Second St. & Covina Blvd., Covina, Cal.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Owen Elec. Mfg. Co., Fayetteville, N. C.
Plastic Arc. See Wilson Welder & Metal Co.
Pyrotip. See General Elec. Co.
Quasi-Arc, Inc., 11 W. 42nd St., New York, N. Y.
Rhason Mfg. Co., 217 45th, Union City, N. J.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Sellars Arc Welder Co., 1200 Fourth Ave., Seattle, Wash.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., 2567 W. Grand Blvd., Detroit.
Taylor-Winfield Corp., Mahoning Ave. Warren, O.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Toledo. See Thomson-Gibb Elec. Welding Co.
Una Welding & Bonding Co., 1615 Collamer Ave., Cleveland, O.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Zeus. See Thomson-Gibb Elec. Welding Co.

WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WICKS, Lubricating
Brawley Felt Co., Inc., T. R., 279 20th, Brooklyn, N. Y.

WINDERS
Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.

WINDING MACHINES, Armature and Field Coil
Acme Electric & Mfg. Co., 1439 Hamilton Ave., Cleveland, Ohio.
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Conran, Frederick M., 107 Colden, Newark, N. J.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., 371 Vinewood Ave., Detroit, Mich.
Line, W. C., 208 S. Geddes, Syracuse, N. Y.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridlon Co., Frank, 253 A St., Boston, Mass.
Segur. See Electric Service Supplies Co.
Seifert, E. R., 315 E. Washington, Syracuse, N. Y.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil
Belden Mfg. Co., 4633 W. Van Buren, Chicago, Ill.
Conran, Frederick M., 107 Colden, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J
Leesona. See Universal Winding Co.

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Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Seifert, E. R., 315 E. Washington, Syracuse, N. Y.
Universal Winding Co., Boston, Mass.
Viking Tool & Machine Co., 747 65th, Brooklyn, N. Y.
Weehawken Engineering Co., 543 Gregory Ave., Weehawken, N. J.
WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory
Athey Co., 6142 West 65th St., Chicago, Ill.

WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Lamp & Tube Filament. See Filaments, Incandescent Lamp.
Magnet. See Wire, Insulated.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Strippers.
Strippers. See Strippers.
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding	See B
Copper Wire	See C
Iron Wire	See S
Phosphor Bronze	See B
Radio Bus Wire	See C
Resistance Wire	See R
Steel Wire	See S

Acme. See Alloy Metal Wire Co.
Alpha Wire Corp., 520 Broadway, New York.. C B ..
Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa. ..... C B ..
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C B ..
American Electrical Works (Phillipsdale), Providence, R. I. ..... C ...
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago.... C .. S
American Steel & Wire Co., 208 S. La Salle, Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y. ..... C ...
Anglite Elec. Co., Fort Wayne, Ind. ..... C .. .
Ballast. See Gilby Wire Co.
Baltimore Copper Mills, Div. of Revere Copper & Brass, Inc., Baltimore, Md. ..... C ....
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. ..... C ..
Belden Mfg. Co., 4633 W. Van Buren, Chicago... C .. S
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. .... B .
Brasslite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn. ..... C ...
Calido. See Driver Harris Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Rdw. N., 70 Ship, Providence, R. I. C ....
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. ..... C .. S
Cornish Wire Co., 30 Church, New York, N. Y.. C ....
Corwico. See Cornish Wire Co.
Crape. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C ....
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 36 E. 20th, New York, N. Y.... C ....
Detroit Insulated Wire Co., Detroit, Mich. ..... C ....
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J. .... B ..
Electron. See Bassett Metal Goods Co.
Excellicier. See Branford Elec. Co.
Fullman Mfg. Co., 1309 Jefferson, Latrobe, Pa.... ....
Gilby Wire Co., Riverside Ave., Newark, N. J.... .. B
Goldmark Co., James, 83 Warren, New York.. C ....
Hope Webbing Co., 1005 Main, Pawtucket, R. I. (Braided Wire Tape) ..... C ....
Hoskins Mfg. Co., 4435 Lawton Ave., Detroit, Mich. .... B ..
Hudson Wire Co., Ossining, N. Y. ..... C B ..
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C .. S
Indiana Steel & Wire Co., Muncie, Ind. .... S
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C ....
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 195 Verona Ave., Newark, N. J. .... B ..
Nehring Electrical Works, De Kalb, Ill. ..... C ....
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. ..... S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Div. of General Cable Corp., Pawtucket, R. I. ..... C ....
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C ....
Rasa. See Rasa Wire Co.
Revolute Wire Co., Hastings-on-Hudson, N. Y.... C ....
Rice Co., A. H., Pittsfield, Mass. ..... C ....
Roebling's Sons Co., John A., Trenton, N. J..... C .. S

Rome Wire Co., Div. of General Cable Co., Rome, N. Y. ..... C ....
Ross Wire Co., 69 Bath, Providence, R. I..... C ....
Seneca Wire & Mfg. Co., Fostoria, O. .... S
Silcrimp. See Valley Narrow Fabric Co.
Silectron. See Standard Alloy Wire Co.
Solar. See Gilby Wire Co.
Sparco Wire Co., J. A., Rome N. Y. ..... C ....
Standard Alloy Wire Co., Elizabeth, N. J. .... B S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. ..... C ....
Super-Insulated Wire Co., Plymouth, Mass. ..... C ....
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C ....

WIRE, Copper Clad
Copperweld Steel Co., Glassport, Pa.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

WIRE DRAWING MACHINES
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American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am., New Haven, Conn.

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WIRE, Insulated

	KEY
Annunciator, Office, Bell Wire	See A
Asbestos Covered Heater Cord	See H
Asbestos Covered Magnet Wire	See M
Enameled Magnet Wire	See M
Fixture Wire	See B
Flexible Reinforced Heavy Duty Cord	See F
Heater Cord	See H
Ignition Cable	See R
Lamp Cord	See B
Magnet Wire	See M
Rubber Covered Wire & Cable	See R
Stove Wire	See H
Telephone Cord	See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. B .. ..
A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn.
Enameled Silk, Cotton .... M
Amelectric. See American Elec.
American Braiding Co., Holyoke, Mass. B .. ..
American Brand. See American Insulated Wire & Cable Co.
American Copper Products Corp., 233 Broadway, New York, N. Y. ....
American Electrical Works (Philipsdale), Providence, R. I. .... M
American Enameled Magnet Wire Co., Muskegon, Mich. .... M
American Insulated Wire & Cable Co. Div. of General Cable Co., 954 W. 21st, Chicago, Ill .... M
American Insulated Wire Corp., 45 Baker, Providence, R. I. ..... R F .. A T ..
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerize. See American Steel.
Amparak. See American Steel.
Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y. ..... R F .. A .. M
Anaconda Wire & Cable Co., Maring Wire Branch, Muskegon, Mich. (Silk, Enamel) .. .. M
Ansonia Electrical Co., Ansonia, Conn. Silk, Cotton, Enameled .... A .. M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston..... B .. ..
Belden Mfg. Co., 4633 W. Van Buren Chicago, Ill. ..... R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... R F .. ..
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H .. .. ..
Bradford, Kyle & Co., Plymouth, Mass. .. .. M
Cablex. See Collyer Insulated Wire Co.
Celatsite. See Acme Wire Co.
Collyer Insulated Wire Co., Pawtucket.. R F H .. ..
Cinderstem. See General Elec. Co.
Colorubber. See Belden Mfg. Co.
Condex. See Simplex Wire Co.
Copperweld Steel Co., Rankin, Pa. ..... B .. .. .. T ..
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Braid, Inc., Providence, R. I. ..... H .. .. ..
Crescent Ins. Wire & Cable Co., Trenton R F H A T M
Darow Mfg. Co., 36 E. 20th, New York. B .. ..
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T ..
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R .. .. .. T ..
Diamond Braiding Mills, Chicago Heights R F H .. .. M
Di-Noburn. See Diamond Braiding Mill.
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J. ..... R .. H .. .. ..
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind. .. .. M
Ducatto. See Dudlo Mfg. Co.
Durabilt. See Anaconda Wire & Cable Co.
Duracord. See Anaconda Wire & Cable Co.
Durawire. See Anaconda Wire & Cable Co.
Duro. See McElroy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R .. ..
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Enterite. See Rome Wire Co.
Fibrex. See Simplex Wire Co.
Flexibls Woven Cable Co., 755 Boylston, Boston, Mass. ..... F .. ..
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. .. .. T ..
GE-Flex. See General Elec. Co.
General Asbestos & Rubber Co., Charleston, S. C. ..... H ....
General Elec. Co., Merchandise Dept., WR323 Bridgeport, Conn ..... R F H .. .. M

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Giant. See Collyer Insulated Wire.
Globe Insulated Wire, 148 Old Colony Ave., Wollaston, Mass. ..... R .. ..
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet .... A .. M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R .. .. .. T ..
Grimshaw. See New York Ins.
Hatex. See Hatfield Rubber Wks.
Hatfield Rubber Wks., Inc., Hillside, N. J. ..... R F H .. T ..
Hazacord. See Hazard Insulated Wire Works.
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa.... R F .. A .. ..
Holyoke Co., 621 Broadway, New York.. R .. .. A .. M
Inca Mfg. Co., Fort Wayne, Ind. .... M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... R F H .. .. ..
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. ..... R .. ..
Kilo, Co., 2 E. 23d, New York .... T M
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. .... T ..
Lowell Insulated Wire Co., Lowell, Mass. R F H .. .. ..
Liberty. See Nat. Metal Molding
Loxsteel. See Hazard Insulated Wire Works.
McElroy, C. H., Lowell, Mass. ..... R .. .. .. T ..
Marion Insulated Wire & Rubber Co., Marion, Ind. ..... R F H A T ..
Massachusetts Elec. Mfg. Co., West Lynn, Mass. .... M
Montgomery Co., J. R., Windsor Locks, Conn. .... T
National Elec. Products Corp., Pittsburgh. R F H A T M
National-Harris Wire Co., 195 Verona Ave., Newark, N. J. ..... R .. ..
New England Elec. Wks., Lisbon, N. H.. R .. ..
N. E. See New England Elec. Wks.
New York Insulated Wire Co., 114 Liberty, New York, N. Y. ..... R .. ..
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co. Also Okecord. See Okonite Co.
Okonite Co., Passaic, N. J. ..... R .. ..
Orex. See Simplex Insulated Wire
Packard Electric Co., Warren, O. ..... R F .. ..
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. .... H A T ..
Phillips Wire Co., Div. of General Cable Corp., Pawtucket, R. I. ..... R .. ..
Providence Insulated Wire Co., Providence R F H A .. ..
Raven Core. See New York.
Reliance. See American Steel.
Revolute Wire Co., Hastings-on-Hudson, N. Y. .... M
Rockbestos Products Corp., 365 Nicoll, New Haven, Conn. ..... R .. H .. T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Inc., Div. of General Cable Corp., Rome, N. Y. .... M
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... R F H .. T M
Ross Wire Co., 69 Bath, Providence, R. I.. R .. ..
Romoxide. See Rome Wire Co.
Ruffcoat. See Rome Wire Co.
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill. .... T ..
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H .. .. ..
Salamander. See York Insulated.
Seward Wire Co., Parkersburg, W. Va. R .. ..
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Shield. See Ansonia Elec'l Co.
Simplex Wire & Cable Co., 201 Devonshire, Boston, Mass. ..... R F H .. T ..
Southern States Cable Co., Div. of General Cable Corp., Mobile, Ala. .... M
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. .. .. H .. .. ..
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T ..
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R .. ..
Strand & Sweet Mfg. Co., Winsted, Conn. .. .. M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn ..... R .. ..
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F .. ..
United States Rubber Co., 1790 Broadway New York, N. Y. ..... R .. H A T .
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. .... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M

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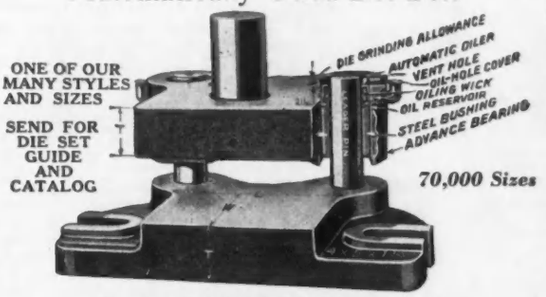

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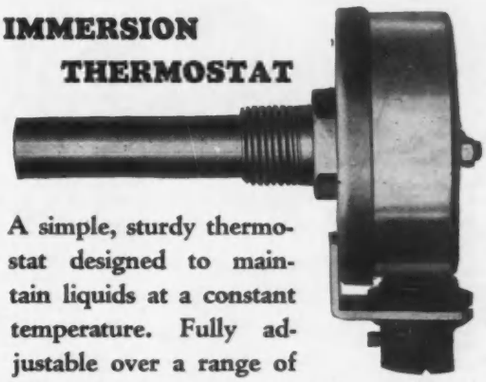

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Braiding Machines ..... See B
Bunching Machines ..... See B
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Insulation Straining Machines ..... See I
Measuring Machines ..... See M
Park Cabling Machines ..... See A
Saturating Tanks ..... See F
Spooling Machines ..... See U
Stranding Machines ..... See S
Tinning Tanks ..... See F
Winding Reels ..... See U

Adamson Machine Co., Akron, Ohio.. I A ..... .
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A .... S U F
Breguet. See American Insulating Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. ..... M .. U ..
Fidelity Machine Co., 3908 Frankford Ave., Philadelphia, Pa. ..... B ..... .
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I ..... t
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. ..... M .. U ..
Nebutteo. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U ..
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I ..... .
Sleeper & Hartley, Inc., Worcester, Mass. ..... A .... S t
Terkelsen Machine Co., Terkelsen Bldg., Boston, Mass. ..... M ..... .
Textile Machine Works, Reading, Pa. .... B ..... .
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn. ..... A ..... U F
Utility Mfg. Co., Cudahy, Wis. ..... I ..... .
Wardwell Braiding Machine Co., Central Falls, R. I. ..... B ..... .
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WIRE VULCANIZING MACHINES. See Vulcanizers.

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Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.

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WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.

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Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
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Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
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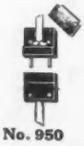

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No. 990

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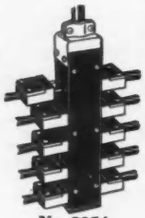

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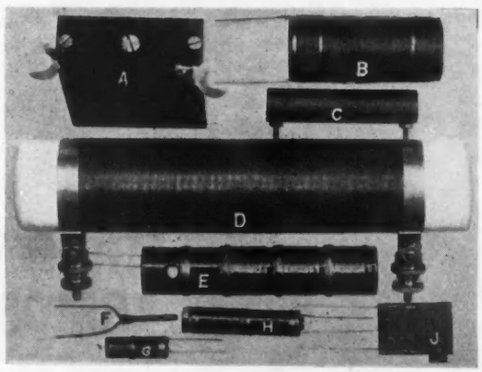

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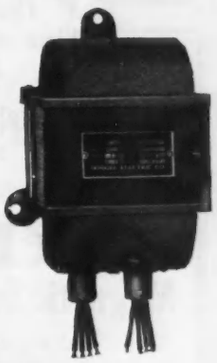

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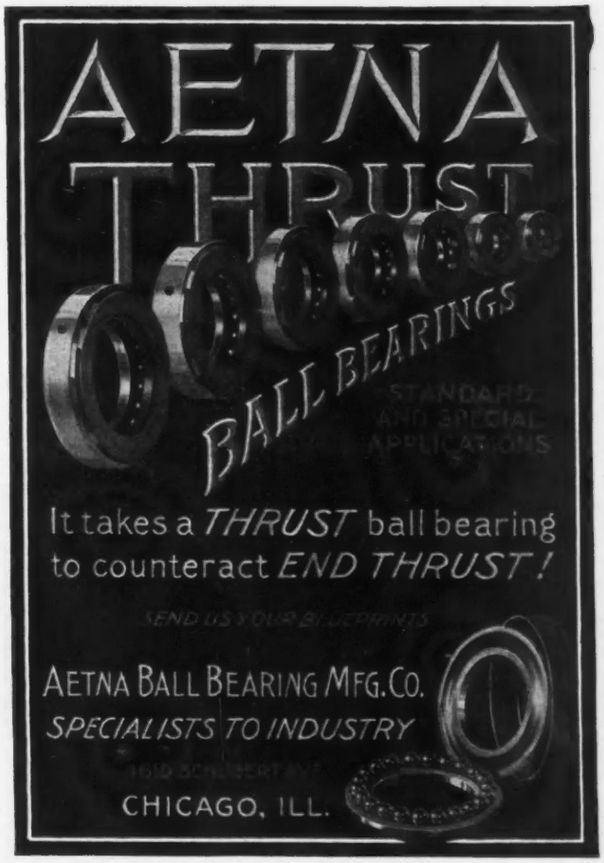

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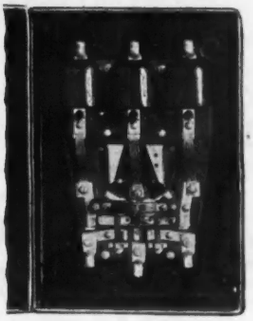

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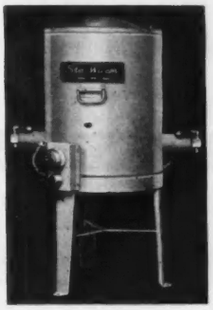

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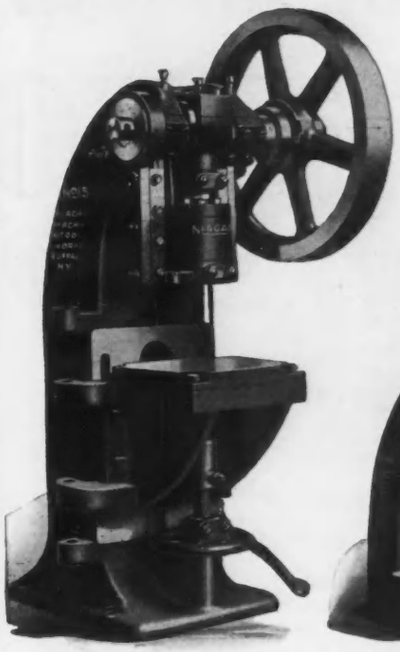

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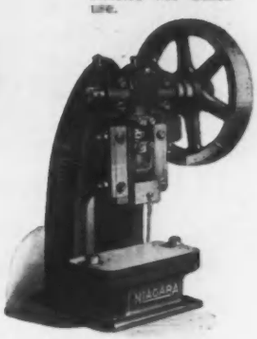

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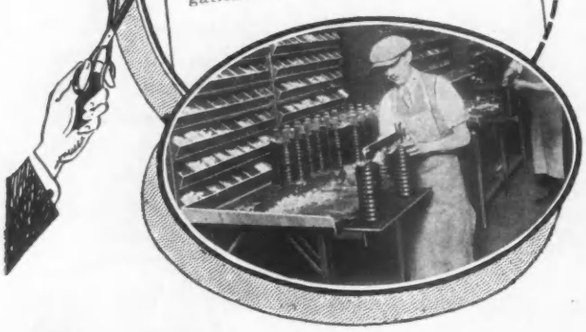
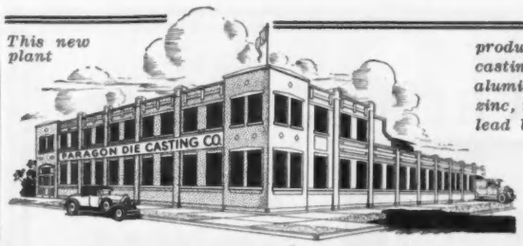


Angle Steel Equipment U.S.STEEL
Permanence in Steel
ECONOMICAL · SANITARY · DURABLE

This new plant

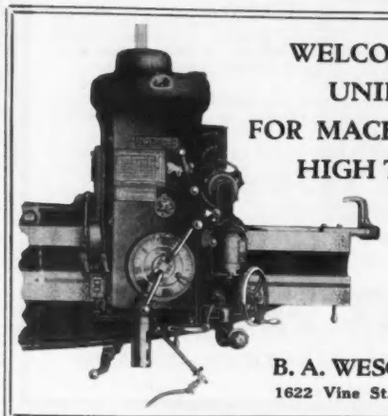


produces die castings of aluminum, zinc, tin or lead base.

PARAGON DIE CASTINGS

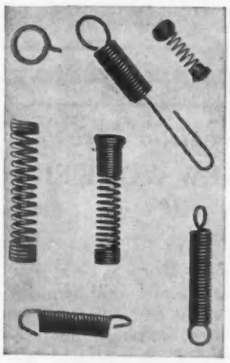
This new plant is devoted entirely to making the highest grade die castings. We make our own dies—we control every operation that completes the job. Let us work with you.

Paragon Die Casting Co., *2701 N.Crawford Ave.Chicago*



WELCO MOTORS UNIFRAME FOR MACHINE TOOLS HIGH TORQUE, TRAVERSE, CLAMP DUTY OUR SPECIALTY.

B. A. WESCHE ELEC. CO.
1622 Vine St., Cincinnati, Ohio



Coil Wire SPRINGS

For all electrical and mechanical manufacturing purposes. All specifications as to quantity and quality are accurately met. Our prices are right and delivery prompt.

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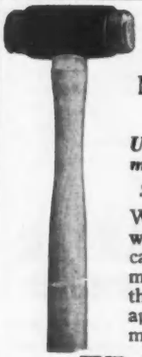
ADVANCE SPRING & WIRE COMPANY
Carroll Ave. and Wood St.
Chicago, Illinois



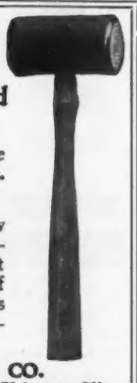
Chicago Rawhide

Mallets and Rawhide-Faced Hammers

Used extensively in electric motor assembly and repair work.

Saves Battered-Up Motor Parts

Will transmit an effective blow without damage to the most delicate surface. The blow is not more destructive to the tool itself than to the object to which it is applied—therefore, doubly economical.



THE CHICAGO RAWHIDE MFG. CO.
1287 Elston Ave., Chicago, Ill.

Weathering—

a great problem of lacquer finishing is solved at last!

Zeller leadership is again indicated by the instant success of the new Zellac "Outdoor Exposure" grades pioneered by this company. Impervious to weather, resisting extremes of exposure in winter or summer, these lacquer materials have been acclaimed by many of the most experienced lacquer users of America.

Zellac "Outdoor Exposure" grades are made for spray or dip application—clear high-gloss or clear satin finish for use directly applied to the surface or as a transparent top coat—and also in pigmented grades. Though prepared in standardized form, these grades can be supplied to specially-developed formula to meet any customer's requirements. Tell us your outdoor exposure finishing needs and let us help you with the correct answer in quality lacquer at low cost.

ZELLER LACQUER MFG. CO., INC.
20 East 49th Street New York City

ZELLAC

FOR EVERY INDUSTRIAL PURPOSE

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LOS ANGELES
PORTLAND
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When Delivery is at Stake

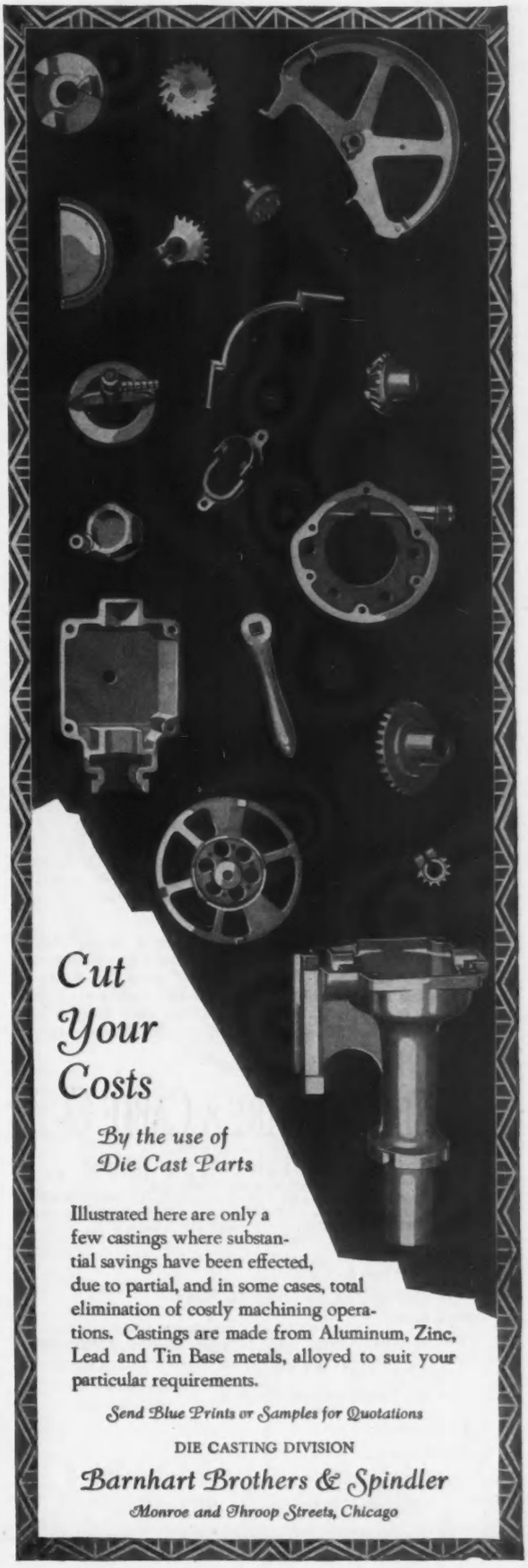
What a comfortable feeling it is, to know there will be no delay in your shipping schedule on account of coils. Enjoy this sense of security by installing a group of

"Universal" Coil Winding Machines

and insure dependable production of uniform coils, in your own plant, at surprisingly low cost

UNIVERSAL WINDING COMPANY
BOSTON

UNIVERSAL WINDERS



Cut Your Costs

By the use of Die Cast Parts

Illustrated here are only a few castings where substantial savings have been effected, due to partial, and in some cases, total elimination of costly machining operations. Castings are made from Aluminum, Zinc, Lead and Tin Base metals, alloyed to suit your particular requirements.

Send Blue Prints or Samples for Quotations

DIE CASTING DIVISION

Barnhart Brothers & Spindler

Monroe and Throop Streets, Chicago

Insure your portables against cord interruptions — equip them with

TIREX CORDS

The importance of the portable electric cord which is supplied as standard equipment by manufacturers of electric tools and appliances is often underestimated.

Many manufacturers are beginning to realize that their equipment may be objectionable to workmen and put on the blacklist by purchasing agents because of tie-ups and replacements necessitated by faulty cords.

Electric tools and appliances equipped with TIREX Cords are always ready for service. TIREX Cords are protected by a "selenium rubber" outer sheath which retains its toughness and wear-resisting qualities indefinitely.

TIREX Portable Cord, Type S, is a heavy duty cord, one that is made for particularly hard service. Type S J Cord is a lighter type of cord for service where the more rugged Type S is not required. Type S Cord is made in one, two, three and four conductors. Type S J is made with two conductors only.

Mail this coupon now.

SIMPLEX WIRE & CABLE Co

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BRANCH SALES OFFICES
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NEW YORK, 1328 B'way CLEVELAND, 2019 Union Trust Bldg.
JACKSONVILLE, 1010 Barnett Nat'l Bank Bldg.

Simplex Wire & Cable Co.,
201 Devonshire St., Boston, Mass.
Gentlemen:
Please send data and sample of the following:
☐ TIREX S J Cord
☐ TIREX Cord, Type S
Company.....
Attention of.....
Street and No.....
City and State.....

CASE BROTHERS

INCORPORATED

Highland Park, Conn.

Manufacturers of

Insulating Papers and Boards

Press Boards

Fuller Boards

TRY US
and you will know why we are always busy on springs and screw machine parts. Quality and service our WATCHWORDS.
The Peck Spring Co.
Plainville, Conn.

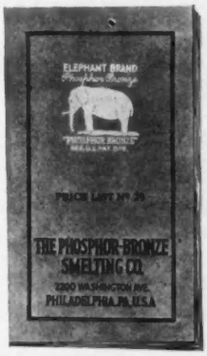
For Better Washers

OF BRASS, STEEL AND COPPER
Highest quality—Low prices
Write Us

MASS. MACHINE SHOP, INC.
BOSTON, MASS.

PHOSPHOR BRONZE
ELEPHANT BRAND

Quality in phospher bronze calls for expert compounding of 100 per cent purity of materials. In this way is Elephant Brand produced, insuring at all times that full dependability which denotes the fine product.



In this book you will find the answer to problems involving the use of specific grades of ELEPHANT BRAND Phosphor Bronze. Write for your copy.

ELEPHANT BRAND comes in ingots, castings, rods, tubes, sheets, wire and rope. The S Bearing Metal is unequalled in Bearing qualities and uniformity. It is typical of our entire output.

THE PHOSPHOR BRONZE SMELTING CO.
2200 Washington Ave. Philadelphia, Pa.

Rome Electrical Company, Inc.
Manufacturers of
Twin, Round, Flat and Square
MAGNET WIRES
Cotton, Silk, Asbestos and
Enamel Covered
Write for Prices
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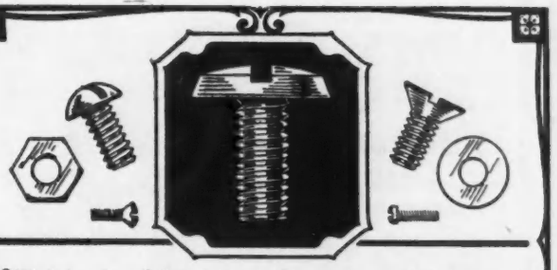
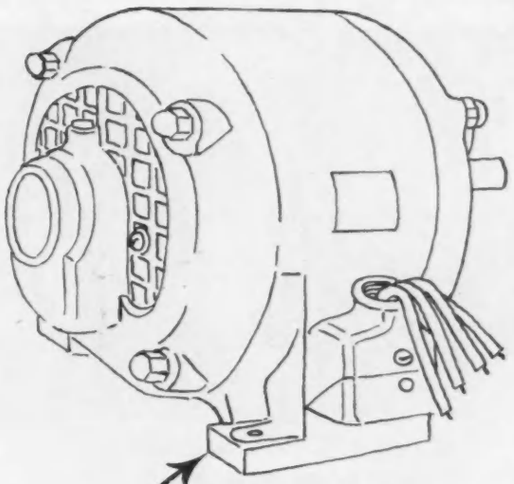


All kinds of Electrical Screws carried in stock
WRITE FOR PRICES
NEW ENGLAND SCREW CO.
DEPT. A
44 FARNSWORTH ST. BOSTON, MASS



HOBBS
for MOTOR MOUNTING

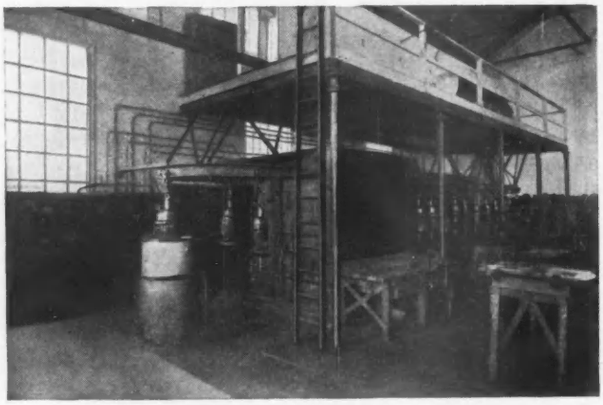
It is on such jobs that Hobbs Lock Washers prove their out-of-the-ordinary quality. A Hobbs-locked bolt isn't going to loosen—the carefully tempered drawn steel takes care of that.

There are hundreds of other applications wherein Hobbs Lock Washers will serve dependably. May we submit quotations together with samples?

We are also equipped to make for electrical manufacturers lock washers of unusual dimensions. However, in the Hobbs Catalog No. 13 will be found lock washers that meet most existing needs.

Hobbs Manufacturing Co.
WORCESTER, MASSACHUSETTS
Not Members of Any Combine

Results of Good Oven Practice



Increase Your Product Uniformity

When you bake the insulating varnish on your armatures and coils you subject every unit to the same pre-determined drying conditions. Consequently they are all dried to the same degree.

You drive off the varnish thinner and lighter volatiles which, if allowed to remai , cause rapid deterioration of the insulating fabric.

You eliminate the danger of air pockets in the interior of the coil.

You develop the highest dielectric strength of your insulating varnish.

You greatly increase the mechanical strength of your coils.

And — you give your completed product the greatest protection against those arch enemies of electrical power units — Dust and Moisture.

Baking insures a more uniform product and a much better product.

For complete information write for Bulletin 27-E.

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Core and Mold baking.
Low temperature heat treating.
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Adapted to all methods of heating.

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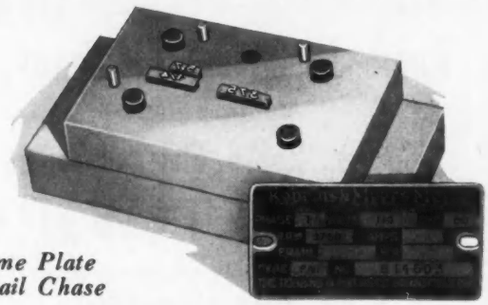
INDUSTRIAL OVENS

Pure Zinc for Fuse Elements
Strip Zinc for Commercial Uses
Eyelets Standard & Special
Large Articles Made on Multiple Plunger Press
The Platt Bros. & Co.
Waterbury, Conn.



Name Plate Detail Chase

Stamp all details in your name plates with one operation. Straight, uniform stamping improves appearance and stamping is done in a fraction of time.

GEO. T. SCHMIDT, INC., 4102 Ravenswood Ave., CHICAGO, ILL.

ELECTRITE

A high grade fibre board for electrical insulation.

A material of quality possessing high tensile and dielectric strength.

Tested and approved by the Underwriters' Laboratories.

Pulp Products Department

WEST VIRGINIA PULP & PAPER COMPANY

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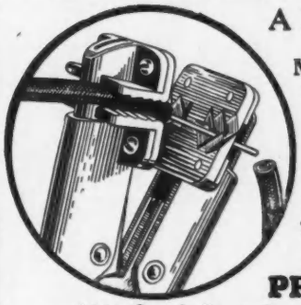
E-Z WIRE STRIPPER

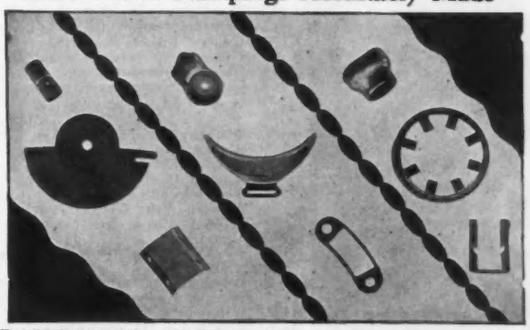
A HANDY TOOL *for all* MANUFACTURERS



Here is a tool that will save you time and money, speed up production and lower your costs.
This inexpensive tool strips wire of 10 to 20 gauge 20 times faster than usual methods. Give it a trial on a money back guarantee. Thousands in use.

PYRAMID PRODUCTS CO.
2311 South State St., Chicago, U. S. A.

Small Metal Stampings Accurately Made



PATTON-MacGUYER CO. — Providence, R. I.

ACME STRIP STEEL

Electric Plug Cover Deep Drawn From Acme Cold Rolled Strip

HOT AND COLD ROLLED

for manufacturing

Electrical Parts

Satin, Nickel Plate Finish in the cold rolled line up to 20 inches wide—Electro Galvanized up to 12 inches wide. Hot Rolled up to 20 inches wide with a finish that is the envy of the industry. All furnished in long length coils or cut to any desired length and straightened. Accurate as to width and gauge. Proper temper for any kind of operation—stamping, forming or deep drawing.

1880 **ACME STEEL COMPANY** 1930
OUR GOLDEN ANNIVERSARY

Hot and Cold Rolled Steel Strip

General Offices:

2832 Archer Avenue -- Chicago

Atlanta, Brooklyn, Detroit, Los Angeles, Milwaukee, San Francisco, Seattle, Montreal

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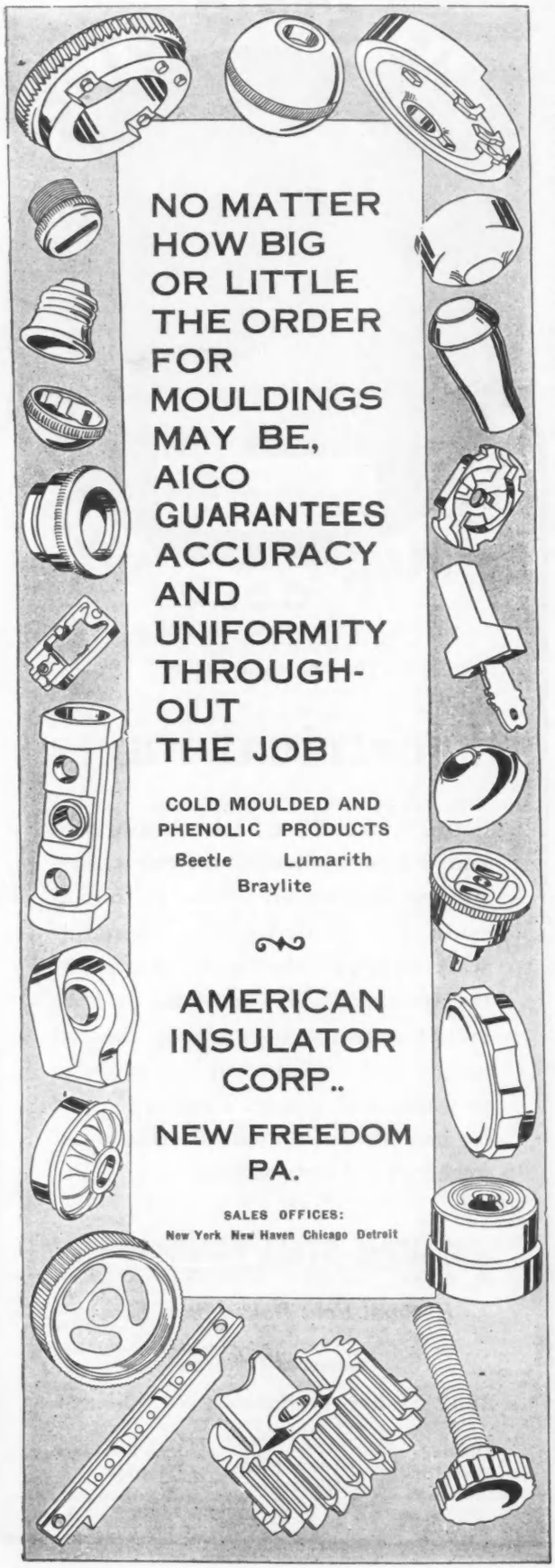

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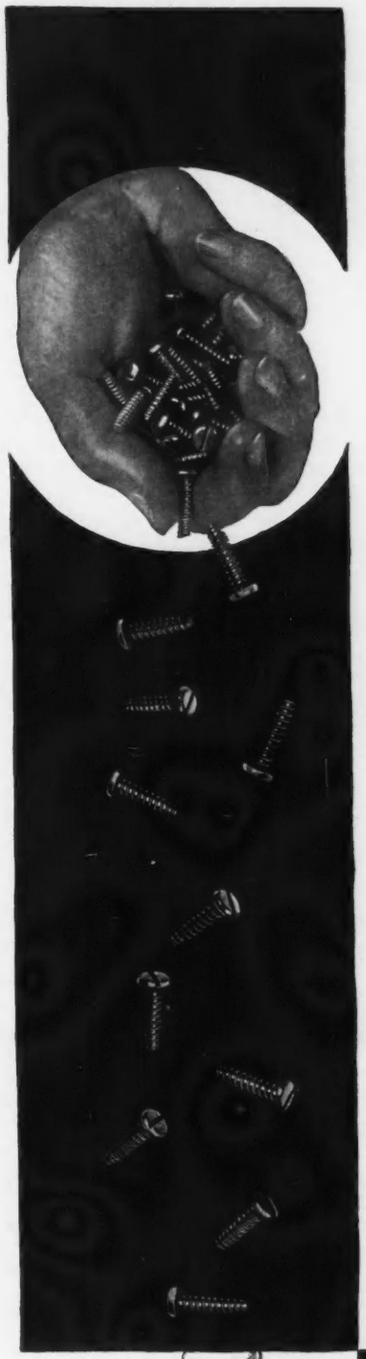


THIS HANDFUL of SCREWS

. . . eliminates 44 tapping operations on each PHILCO Radio

All along the assembly line at the plant of the Philadelphia Storage Battery Co., wise production heads have reduced cost and trouble to a minimum in the assembly of Philco Radio receivers and speakers. Tapping was one of the principal difficulties but it was quickly and effectively eliminated by the Philco Engineers.

How? . . . Simply by replacing machine screws with Hardened Self-tapping Sheet Metal Screws. Forty-four of these unique Screws abolished 44 tapping operations on each Philco Radio. In addition they effected a saving in time and labor of over $16,000 in a year.

Used profitably on all kinds of electrical products

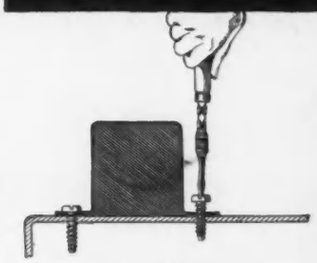
Radio assembly is but one of numerous applications for which Self-tapping Screws are used profitably. Manufacturers of electrical products of every description have speeded-up production and cut assembly costs by using Self-tapping Screws for making fastenings to sheet metal and solid sections of aluminum and die castings, Bakelite, slate, ebony, asbestos, etc. And fastenings made with these Screws hold securely even under vibration.

Test them yourself. Send description of your assemblies for free samples.

PARKER-KALON CORPORATION
Dept. K, 190-204 Varick Street, New York

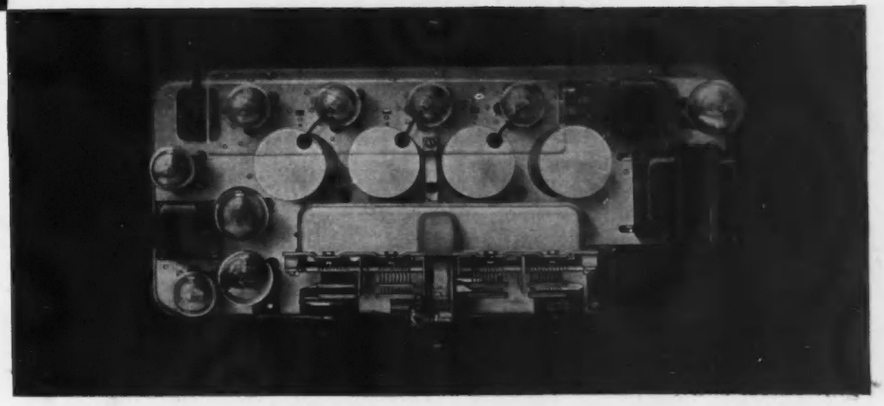
PARKER-KALON
HARDENED TYPE Z SELF-TAPPING
Sheet Metal Screws

PATENTED
APR 1, 1919 - No. 1299232 — MAR 29, 1922 - No. 1411184
AUG 14, 1923 - No. 1465146 — FEB 10, 1925 - No. 1526162
OTHERS PENDING



These Screws Tap their own Thread

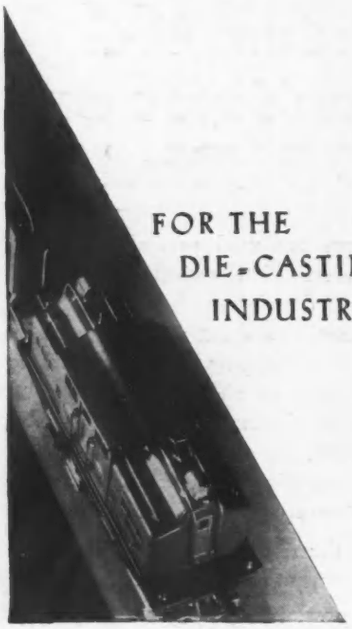
Simply turn a Self-tapping Screw into a drilled or pierced hole. It taps its own thread in the metal — holds better than a machine screw—even under vibration.



HORSE HEAD

UNIFORM QUALITY

ZINC



FOR THE DIE-CASTING INDUSTRY

Toy Locomotives Die Cast From Alloys Of Horse Head Zinc. Finished In A Variety Of Ways—Lacquer, Enamel, and Chromium Plate

In toys, too . . . Faithful reproduction . . . detailed design . . . durability of parts and finish . . . all appeal to the customer and increase sales. Die casting thousands of identical pieces decreases costs.

Die castings, cast from alloys of Horse Head Zinc, can be depended upon for uniform performance. Carburetors, cowl lamp brackets, magneto and generator housings inside and outside hardware, as well as toys, embody the tried uniformity of Horse Head Zinc with the proved production advantages of die casting. The result? Strength, uniformity, and thus always, dependability.

New Jersey Zinc

THE NEW JERSEY ZINC COMPANY

160 FRONT STREET, NEW YORK CITY

Zinc Metal and Alloys - *Rolled Zinc* - *Zinc Pigments* - *Sulphuric Acid* - *Spiegeleisen*